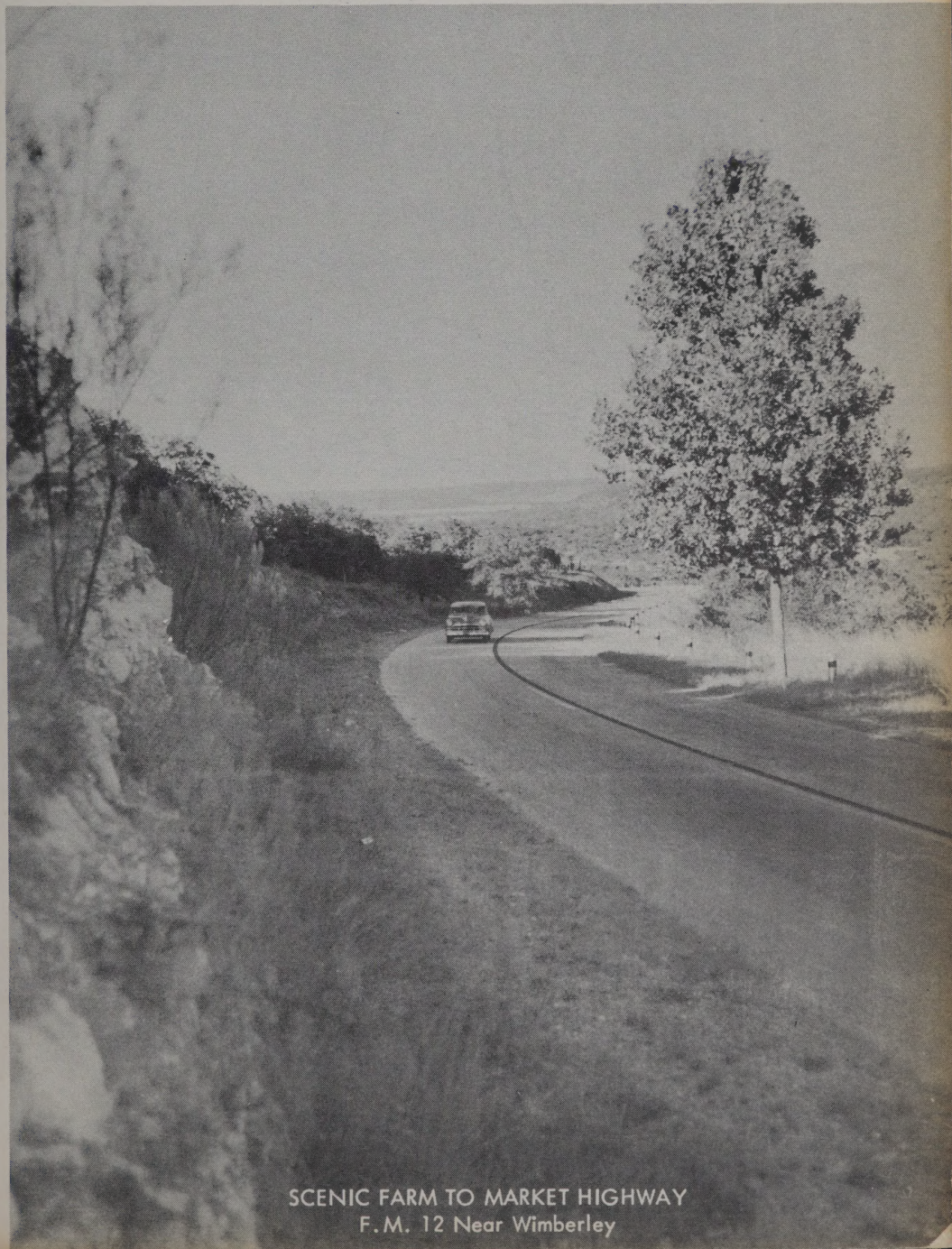




TEXAS HIGHWAY DEPARTMENT

Construction & Maintenance

BULLETIN No. 7
July, 1951



SCENIC FARM TO MARKET HIGHWAY
F.M. 12 Near Wimberley

Foreword

This bulletin is published for the purpose of presenting practical information applicable to current highway problems. These conclusions and data are not necessarily endorsed by the Highway Department nor are they to be construed as instructions. Employees are invited and urged to submit suggestions and relate experiences which would benefit those engaged in the construction and maintenance of highways.

Photographic services are available and other assistance may be obtained if desired in preparing material for submission. All material and comments should be directed to the Chief Engineer, Construction & Maintenance, Austin, Texas.

Published Jointly by

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Construction Division.....	D- 6
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COMPILED AND EDITED
INFORMATION SECTION,
TRAFFIC SERVICES DIVISION

REPRODUCED
OPERATIONS DIVISION
TEXAS HIGHWAY DEPARTMENT
AUSTIN 14, TEXAS

Equipment & Procurement

Construction

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Maintenance

Traffic Services

As We See It!

The days when we could readily secure all the material, equipment, services and supplies that were needed have gone. They were happy days, but they may not be here again for several years.

In the meantime, the department must continue operations — keep rolling.

In these days of half war and no peace, the similarity of conditions now, with the early years of World War II, is a pay-off on experience. Those of us who went through the tightening supply conditions of a decade ago are falling easily in tune with the needs and trends as they unfold today. It is this know-how that will see us through "the long tomorrow" you hear so much about now days.

On the other hand, there was never a greater need in the department for fresh ideas and unrestrained thinking. It is in the field of substitutes and adaptations that the fresh viewpoint has its greatest opportunity to be of service. Just plain ability to adopt something new or to adept something different can be a mighty handy asset in the department.

"Keep rolling" is the department's business.

It is both your business and mine!

Hot Mix Asphaltic Concrete Laboratory

COOPER DEWEY

SENIOR RESIDENT ENGINEER

A twenty mile section on U. S. 90 from Houston to the Liberty County line in Harris County was placed under contract in August, 1950. This contract provided for widening the existing twenty foot concrete pavement to 24 feet and placement of three and one-half inches of surfacing. The base widening was done with Type "A" Hot Mix Asphaltic Concrete Mixture and the surfacing with Type "D" Mixture. The work was similar in nature to that described by Mr. Gilbert A. Youngs in Construction and Maintenance Bulletin Number 2.

Two hot mix plants were set up on the project in order to speed up the work. The Type "A" mix was produced by a Warren "400" plant of the weigh-batch type. Type "D" mix was produced by a Barber-Greene continuous mixing plant. After completion of the Type "A" mix, both plants were used in the production of Type "D" mix for the surface courses. Surfacing was placed in three courses. The third course contained sections of gravel, limestone, and oyster shell as coarse aggregates.

The base widening and first two surface courses contained gravel as a coarse aggregate.

The use of two plants more than doubled the laboratory work due to the difference in their manner of operation. In addition to the minimum requirements for screen analysis, stabilities and extractions on both plants, the nature of the fine aggregates made it necessary to hold a close control on the cold aggregate feeder. A continuous check was maintained on the aggregates, cold feed proportions, and the completed mixture.

In order to speed up tests some modifications were made in laboratory equipment. Electric motors were placed on the extractor and sieve shaker. A specimen press was devised for the purpose of removing stability specimens from the laboratory press mold. Another development was the use of a stand, hood, and exhaust hose for burning off carbon tetrachloride. A collar was placed under the platen of the hydraulic jack on the laboratory press to limit its lower position to that only neces-

sary to remove the molding assembly. Most of the ideas mentioned are those of Mr. C.R. Doyle, Chief Inspector. Photographs and sketches on these pages show the results of these ideas. A brief description of this equipment is offered for further information.

The top section of the hand extractor was removed from its base and placed on the metal stand as shown. This stand was made in the District Shop and the electric motor was purchased locally. The motor must handle a heavy starting load. Both the motor and pulley are protected by a heavy cover bolted to the stand. The various pulley sizes, etc., are shown on the drawings. Total cost for the added equipment was \$58, of which approximately \$25 was for the electric motor.

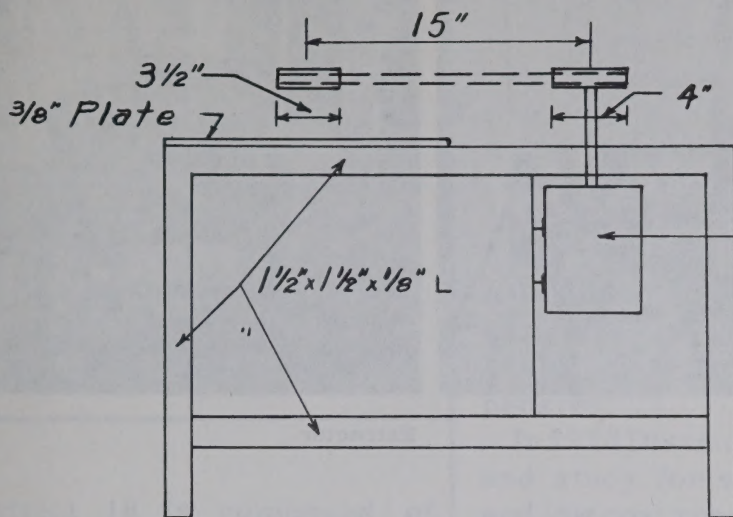
The hand crank on the sieve shaker was removed and pulleys and motor were installed. Supporting rods for the sieves had to be enlarged to three-eighths inch for more strength and to permit heavier clamps to be used to hold down the sieves. The total cost of this added equipment was \$10.55. No changes were made in either the sieve shaker or extractor that would prevent their use as regular hand equipment.

Cost of the specimen press and other incidental laboratory equipment was negligible and is included in the \$58 cost for the extractor. Burning of carbon tetrachloride was done outside the laboratory after several weeks of trying to do it inside. This was

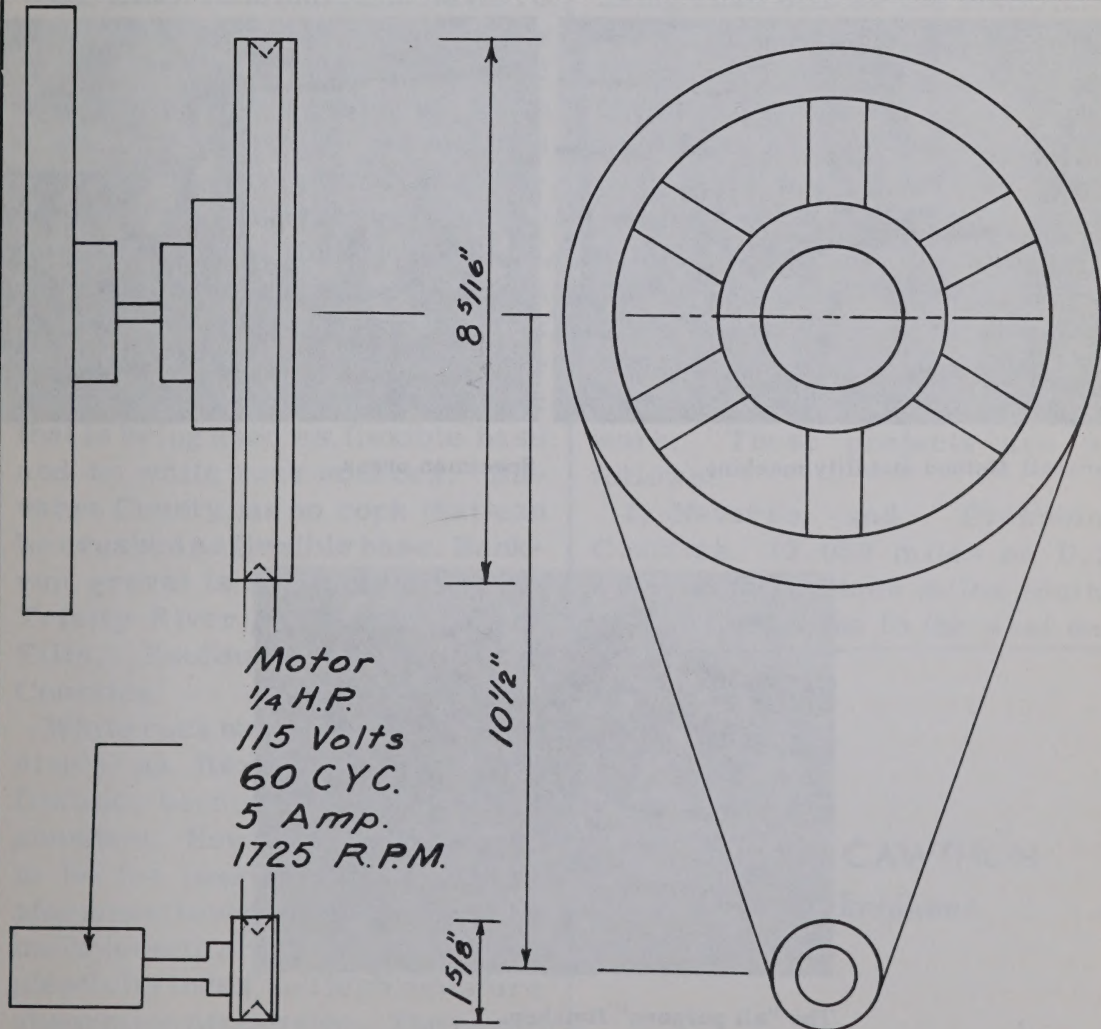
learned the "hard way" after too much breathing of the fumes.

It might be of interest to mention the use of the Marshall Method for stability tests on this project. The testing equipment was furnished by the Construction Division for research purposes in determining the correlation, if any, between Hveem stability and Marshall stability. No correlation was found between the two methods on the field mixes. Gravel, shell, and iron ore aggregates have been tested with similar results.

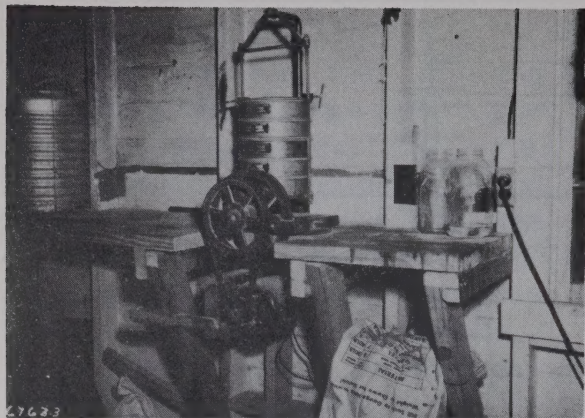
Although not pertaining to this article on laboratory equipment, some mention of the road equipment used on the project might be made. The "all purpose" trench roller, trench widener and finisher were new types of equipment to this locality. The roller and widener have been used in other areas for some time. The trench roller has a drive wheel five feet in diameter which compacts the mix better than wheels of smaller diameter. Leveling of the roller is obtained by hydraulic control. The trench widener laid strips from two feet to eight feet in width and of any depth required. The finisher was shipped to the project on a trial basis. It was a pilot model, and in view of the experience on this job, some minor changes are indicated. The screed provided a tamping and leveling action which, after some adjustments, gave the surface a texture and riding quality comparable to other finishers now in use.



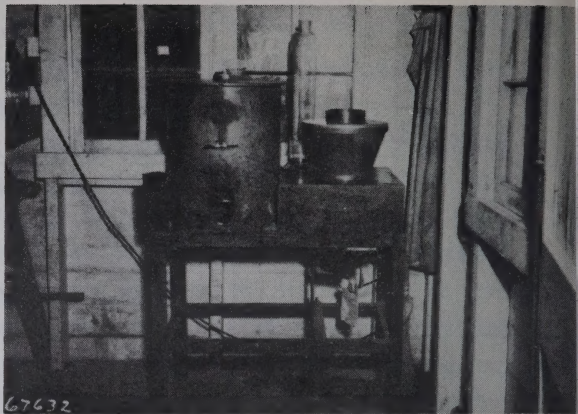
EXTRACTOR STAND



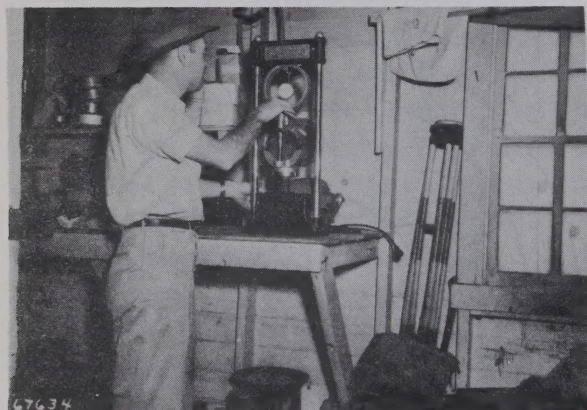
SIEVE SHAKER



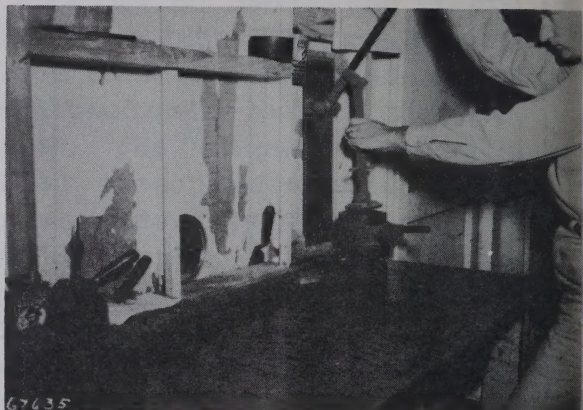
Sieve shaker.



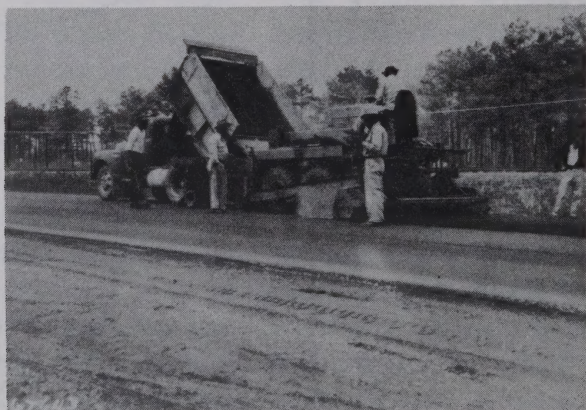
Extractor.



Marshall Method stability machine.



Specimen press.



The "all purpose" finisher.

SOIL STABILIZATION IN DISTRICT 18

District 18 is composed of Denton, Collin, Dallas, Rockwall, Ellis, Kaufman, and Navarro Counties, and is predominantly in the black land belt. Our local base materials consist of white rock, bank-run river gravel, and a small amount of a hard conglomerate located along the eastern part of Kaufman County. Denton, Collin, Dallas, and Ellis Counties have an abundance of white rock. Rockwall County has only one source of medium hard sandstone that is being used as flexible base and no white rock sources. Navarro County has no rock that can be crushed as flexible base. Bank-run gravel is available along the Trinity River in Denton, Dallas, Ellis, Kaufman, and Navarro Counties.

White rock has been used extensively as flexible base in this District because it is cheap and abundant. However, it has proven to be the least desirable of the aforementioned materials. The main defects are lack of body, high plasticity index, and high moisture absorption properties. The bank-run gravel available is little, if any, better than white rock. The

characteristics are low plasticity index, deficiency of plus one-fourth inch material, and lack of suitable binder material. Consequently, the flexible base roads constructed from each and various combinations of these materials have been very susceptible to damage from wet freezes. This has made maintenance very expensive.

In 1938 District 18, in its search and study for a suitable medium and low cost road, started experimenting in soil stabilization, using road oils as the stabilizing agent. These first tests were made in Kaufman and Navarro Counties in areas where sandy loam was available. Some tests have been made since on black gumbo soils with lime and cement but to date results obtained have not encouraged us to try any large scale projects.

In October, 1938, our first projects were let in soil stabilization work. These projects are as follows:

1. Navarro and Freestone Counties, 12.059 miles on U.S. 287- from fourteen miles south-east of Corsicana to the west end

FRANK W. CAWTHON
District Engineer

of the Trinity River Bridge, 7.663 miles in Navarro County and 4.396 miles in Freestone County. These projects were constructed as C 122-2-3 and C 122-3-3 and were completed in August, 1939. On C 122-2-3 a mat was stabilized four inches in depth with one section 34 feet in width and one section 20 feet in width, on which a single asphalt surface of 0.5 gallon per square yard of O.A. 135 was placed 22 feet and 20 feet respectively. On C 122-3-3 a single asphalt surface of 0.5 gallon per square yard of O.A. 135 was placed 20 feet in width on a mat four inches in depth, with one section 24 feet in width and one section 20 feet in width. The stabilized mat on these projects consisted of a sandy loam that was in place on the road mixed with approximately 9.3 per cent by weight of RO 3. The mixing was done with disc harrows, spike tooth harrows, and blades. The soil to be stabilized was bladed first into two windrows on each side of the crown. This material then was bladed back in layers and mixed with the RO 3 until the depth desired was attained. The cost per square yard of stabilized mat, including the single asphalt surface that was placed thereon, was 33 cents.

2. Kaufman County, 5.562 miles on S. H. 205--from Terrell to Rockwall County line. This project was constructed as C 451-2-3 and completed in August, 1939. On this project a single asphalt surface 22 feet wide was placed on a four inch depth mat 34 feet in width. One short section of the

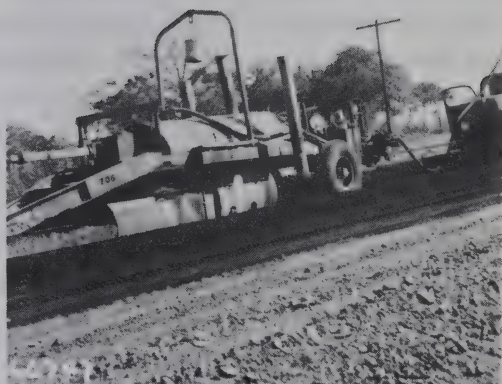
mat in the city of Terrell was 44 feet wide. The stabilized mat on this project consisted of a sandy loam material that was in place on the road mixed with approximately 10 per cent of RO 3 in the same manner as described above. The cost of the stabilized mat on this project, including the single asphalt surface treatment, was 31.6 cents.

In June, 1940, another project was let on 9.205 miles of S. H. 34 from Purvin to Kaufman. This project was let as F.A.P. 1031 A (3) and completed in March, 1941. The stabilization on this project consisted of selected sandy loam mixed with approximately 6.33 per cent by weight, of RO 3. This material was mixed in a central mixing plant and hauled in trucks and dumped on the subgrade. This stabilized material was placed in a mat 30 feet in width and six inches in depth on 5.585 miles and five inches in depth on 3.62 miles on which a single asphalt surface of 0.4 gallon per square yard of O.A. 135 was placed for the full 30 feet width. The cost per square yard of the stabilized mat and single asphalt surface treatment for this job amounted to 61 cents.

In February, 1943, project L 162-8-1 was started on the 2.382 mile spur from S. H. 31 (now F.M. 55) near Silver City to Purdon in Navarro County. The stabilization on this project consisted of the mixing of a pack sand material with 5.5 per cent by weight of RC-2. A single asphalt surface of 0.5 gallon per square yard OA 230 was placed over the stabilized mat which was 24 feet



Left side view - Wood Travel Plant scooping up windrowed material. Note the base material in foreground.



Left side view of Wood Travel Plant.



Left side view - Wood Travel Plant and Asphalt Tank Truck. Note Caterpillar pulling Wood mixer.



Wood Travel Plant drawn by Caterpillar. Asphalt Tank-truck following.

wide and six inches in compacted depth. The cost per square yard of stabilization and single asphalt surface on this project being 44 cents, or \$6,209.27 per mile. The mixing of the stabilized mat on this project was accomplished with a P & H one pass road mixer. The use of the P & H machine on this project marked its initial use in Texas and the results obtained were observed closely by the manufacturers, contractors, and engineers.

In August of 1944, two projects were started on S. H. 34 in Kaufman and Ellis Counties. Sections aggregating 2.157 miles between the Trinity River and a point 6.5 miles northeast in Kaufman County were stabilized for a six inch depth and a 24 foot width with approximately 3 per cent RC-2 and sections aggregating 2.575 miles between a point 8.5 miles east of the Trinity River and a point near the Trinity River in Ellis County were stabilized for a six inch depth and a 24 foot width with approximately 8 per cent cement. Both projects were constructed by blade mixing of the stabilizing agent with selected sandy loam by state forces. A 0.3 gallon per square yard seal coat was placed on both types of base. The soil asphalt sections cost 42 cents per square yard for base and surfacing work and the soil cement sections cost 74 cents per square yard. The work was completed in February, 1945.

The various stabilization jobs described above were observed from the dates of completion, with particular notice being kept on

their behavior during the winter months when damage from wet freezes is usually heavy. Since this type of construction apparently suffered less freeze damage than did our white rock and gravel base jobs it was decided to specify soil stabilized base on a number of projects in the Farm to Market Road Programs in localities where the greatest scarcity of base material existed.

To date we have constructed a total of 118.4 miles of soil asphalt stabilized base on 23 projects and 8.3 miles of soil cement stabilized base on two projects. All of these bases were placed directly on natural subgrade with no type of subbase treatment. The P & H, Barber-Greene, Woods, and Madsen mixing machines have been used on various projects and all have produced good mixes.

These soil stabilization jobs have not been completed long enough to draw a definite conclusion as to the length of service we can expect or a very good idea as to the maintenance cost, but to date they have proven more successful than the thin white rock and local gravel farm road bases in this area.

Below are pictures of the Woods Mixing Machine in operation on F. M. 986, Kaufman County. The roadbed treatment material for this project was a sandy loam identified on the soil map as Tabor-Lufkin Complex. One hundred per cent of this material passed the 40 mesh sieve and the average P. I. as determined by field tests was five.

After all grading work was com-

pleted the contractor broke out a section nineteen feet wide and one inch deep and bladed it both ways, giving a trench in which to place the roadbed treatment material and shoulders against which the asphalt stabilized base could be rolled. The roadbed treatment material was hauled to the road and dumped in the amount of 33 cubic yards per station in two windrows. After the mixing of the roadbed treatment material and the RC-2 with the Woods machine was completed the material was aerated with blades and a pulvamixer until the volatiles were sufficiently evaporated for the base to be laid in. The base was then bladed to shape in one and one-half inch to two inch layers and compacted with a pneumatic roller. The contractor on this particular job kept his aeration and finishing work progressing just behind his stabilizing, thus greatly decreasing the chance of having subgrade and un-

laid base ruined by wet weather. The cost of the "Roadbed Treatment," "Soil Asphalt Base Processing," and "Asphaltic Material" for this nineteen foot width, four inch compacted depth base amounted to \$5,675 per mile or 48 cents per square yard.

After the base had been in place long enough to be observed for subbase failures or base cracks, a surface treatment of 0.5 gallon OA-135 per square yard was placed.

Below are pictures of the Barber-Green Mixing Machine in operation on F.M. 1140, Rockwall County.

The roadbed treatment material for this project was a pit-run gravel with binder and sand added and this was the only one of the nineteen soil asphalt stabilization jobs which utilized a material other than sandy loam to stabilize. Following is the screen analysis of the roadbed treatment material used:

Gravel	Retained on 1/2" screen	2%
	Retained on 1/4" screen	12%
	Retained on 10 mesh sieve	42%
	Retained on 40 mesh sieve	85%
Sand	Retained on 40 mesh sieve	0% (clean white sand)
Binder	Retained on 40 mesh sieve	0% (Calcareous clay)

A mix of 75 per cent gravel which had a P. I. of 4 $\pm$, 10 per cent sand which had a P. I. of 2 $\pm$, and 15 per cent calcareous clay binder which had a P. I. of 15 $\pm$, produced a material which gave an average P. I. of 8.5 as determined from fourteen road tests.

The roadbed treatment material was loaded by dragline at the pit

and hauled to the road in five cubic yard dump trucks and 33 cubic yards per station was dumped in single windrow. The entire windrow was mixed adequately with a single pass of the Barber-Greene machine. The mixing of the 4,275 cubic yards of roadbed treatment material and the 64,760 gallons of RC-2 required on this job was



Front view-Barber-Greene scooping up windrowed base material.



Barber-Greene in operation. Note windrowed base material, being scooped up in front, and windrowed asphalt stabilized material behind.



Rear view - soil asphalt base material after mixing and windrowing by Barber-Greene. Note Asphalt Tank-truck following.



Rear view showing Barber-Greene, Asphalt Tank-truck and windrowed asphalt stabilized base material in position for spreading.



Front view - base material being scooped into Barber-Greene travel plant.

done with this machine in three full working days.

Aeration of the mixed material was done with two blade graders until a field laboratory test showed not more than 2 per cent of moisture and/or volatiles remaining in the mix. It was then laid in place by blading and rolling with a sheepsfoot roller. Finish rolling was done with a pneumatic roller. A wooden template cut to shape and width of the finished section was used to check the completed surface.

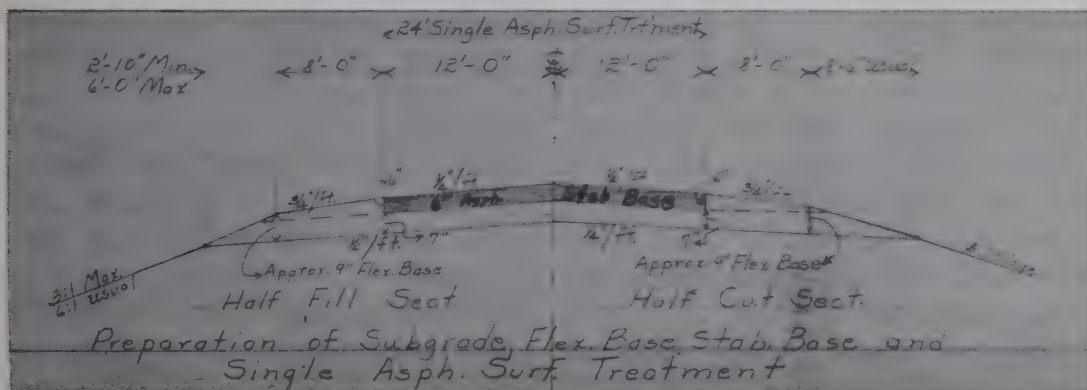
The cost of the "Roadbed Treatment," "Soil Asphalt Base Processing," and "Asphaltic Material" for this nineteen foot width, four inch compacted depth soil asphalt stabilized base amounted to \$7,490 per mile or 66 cents per square yard. The cost of the gravel "Roadbed Treatment" used on this job was considerably more than the cost of the sandy loam used on other stabilization jobs in the District so a higher per mile cost of construction resulted.

A 0.4 gallon per square yard single asphalt surface treatment was placed on this stabilized base.

The average cost of the nineteen foot width, four inch depth Farm Road jobs constructed has been \$5,750 per mile or 50.5 cents per

square yard as against \$7,050 per mile or 64.5 cents per square yard for the nineteen foot width, five inch depth jobs constructed. One of the earlier jobs built, when sixteen foot width was permissible, was a six inch depth stabilization which resulted in a cost of \$6,850 per mile or 69 cents per square yard.

In addition to the soil asphalt and soil cement stabilization jobs constructed as low cost bases, we constructed in 1949, 25.4 miles of thirteen inch depth gravel base on S.H. 24 and S. H. 121 in Collin and Denton Counties on which the top six inch depth of the thirteen inches of gravel was stabilized for 24 foot width with RC-2. All of the four jobs were identical in section. Following is a report on Project F-1085 (9)-3 on S. H. 121 in Collin County from Denton County line to F. M. 720 three and one-half miles southwest of McKinney. Construction operations on the other three projects were similar. This project runs, southwest to northeast, from the Denton County line to a point three and one-half miles southwest of McKinney, Collin County. The project is 12.35 miles in length and was built on new location. The grading and drainage structures



were built on a separate contract from July 6, 1948, to June 22, 1949, by Oran Speer. Base and surface work were awarded to R. W. McKinney, July, 1949, and work began August 18, 1949. Work was completed July 25, 1950.

The typical cross-section above indicates the work accomplished.

The base material was a pit run gravel hauled from Denton County, and the specified screens and soil constants were as shown below:

SCREENS

Retained on 2" screen	0%
Retained on 1/2" screen	15-60%
Retained on 1/4" screen	30-75%
Retained on 40 mesh sieve	60-85%

SOIL CONSTANTS

Liquid limit shall not exceed	35
Plasticity index shall not exceed	12
Linear shrinkage shall not exceed	7%

The material placed on the road tested as shown below:

SCREENS

		Av.
Retained on 2" screen	0%	
Retained on 1/2" screen	15 to 30%	22%
Retained on 1/4" screen	30 to 45%	38%
Retained on 40 mesh sieve	60 to 83%	72%
Retained on 10 mesh sieve	46 to 52%	49%

SOIL CONSTANTS

	Av.
Liquid Limit = 22-30	24
Plasticity Index= 6-12	9
Linear Shrinkage = 3.3-7.0	5%

The gravel pit was opened in an L shape because the material was nonuniform, and had to be loaded from two sections of the pit to give the specified material on the road. One leg of the L was pure sand and gravel with practically no P. I. , while the other leg of the pit contained gravel and clay of relatively high P. I. An inspector was kept at the pit to see that the loading was properly done and the right proportions were delivered to the road. Two machines were used to load from different parts of the pit. The trucks were distributed between the two machines as the material varied.

The material, when dumped on the road, received a thorough

mixing by use of motor graders and a disk plow. When properly mixed the course was rolled in with a pneumatic roller. Water, when needed, was added during the mixing operation.

Base material was hauled in three layers. The first course was four inches deep; the second, three inches deep; and the third, six inches deep. The roadway was put to final section prior to stabilization. When the roadway was

put to final section it was understood a P & H Machine would be used. The contractor, just prior to the stabilizing operation, made arrangements for a Madsen Road Pug and the Madsen was used.

The change in machines made it necessary to cut the trench section, and windrow the material to be stabilized. The roadway being to grade, and the stakes still being in, made this a simple operation. The contractor cut out approximately five inches, windrowed the material, and grade stakes were set for the subgrade. The subgrade was trimmed, and this material bladed into the windrow for stabilization. The material was then cut into three equal

windrows for the Madsen Machine to stabilize.

The usual rate of travel of the machine was 30 feet per minute, which obtained full capacity of the pug mill and mixed approximately 390 tons per hour. A 4,000 foot section was the usual distance laid out for a mixing operation.

The material after mixing was allowed to aerate for three days. During this period it was turned with a maintainer often enough to allow the volatiles to pass from the mix.

The stabilized material was then laid in three two-inch lifts with a maintainer, and each lift rolled in with pneumatic rollers. A tamping roller was used on the first courses placed, but was dispensed with on later courses as no additional density was gained.

The design of the stabilized foundation course followed State Highway Department Test Procedure THD-98, Modified Bearing Value Test of Soil-Bituminous Mixtures. This test resulted in using 10.1 per cent moisture for - Number 10 mesh sieve material and 0.50 per cent moisture for + Number 10 mesh sieve material to obtain optimum moisture content, and using from 7 to 8 per cent RC-2 for - Number 10 mesh sieve material and 0.5 per cent RC-2 to coat + Number 10 mesh sieve material to obtain maximum results. When the final six inch layer was being placed, screen analyses of the + Number 10 mesh sieve material were made and recorded for each

500 feet of roadway. After the design was completed, the per cent of RC-2 required was calculated with the use of the screen analysis for each 500 feet of roadway. The + 10 mesh sieve material varied from 44 per cent to 50 per cent resulting in the optimum moisture varying between 4.72 per cent and 5.30 per cent and the asphalt content varying between 4.09 per cent and 4.65 per cent of the total dry loose weight of the material. The Madsen Road Pug is calibrated to use gallons of asphalt per lineal yard of travel; therefore, the per cent of asphalt by weight had to be converted to gallons per lineal yard. A table was made showing station number of roadway, + Number 10 mesh sieve material, per cent of RC-2, and gallons per lineal yard of RC-2. With the aid of this chart, the per cent of RC-2 was controlled throughout the job. The moisture content of the base material was controlled to allow for thorough mixing with the RC-2. After the Madsen mixed the three windrows and the material was thoroughly mixed, aerated, and rolled into place, a density for each 1,000 feet was determined by use of Test Procedure THD-87, Determining Density of Material in Place (Sand-Funnel Method). The specifications state that the density shall not be less than 90 per cent. The densities obtained were between 94 per cent and 100 per cent.

The following sheet gives design data:



Material in three windrows for stabilization.

Stabilizer processing material.



Material being taken into machine.

Material being discharged from machine.



Collin County F-1085 (9)

State Hwy 121-Lucas Pit

Lab. No. 1-50-20

Curve ① Mixed Wet, Dried And Molded Dry At 800 Blows per Layer, Tested Immediately

Curve ①A Same Specimen As in Curve ① Re-Worked, An Additional 800 Blows And Tested Immediately. Curve ② Molded at 50 Blows Per Layer At Optimum Liquid Content, Dried¹⁴ And tested Dry. Curve ③ Same Specimen As in Curve ② Tested After 7 days

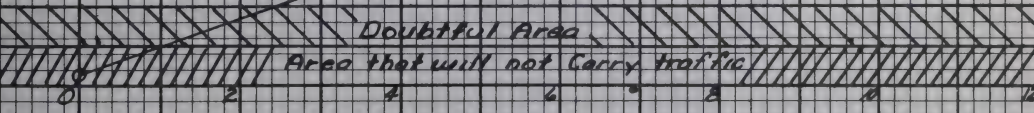
④ Capillarity Curve ④ Absorption of Moisture After 7 Days Capillarity.

Modified Bearing Value in Lbs Per Sq. In For 1/4" Penetration

Percent Moisture Absorbed Curve ④

9000
8000
7500
7000
6000
5000
4000
3000
2000
1000
0

12
10
8
6
4
2
0



Percent R62 On Basis of Dry Weight of Soil Passing No. 10 Screen



One processed windrow.



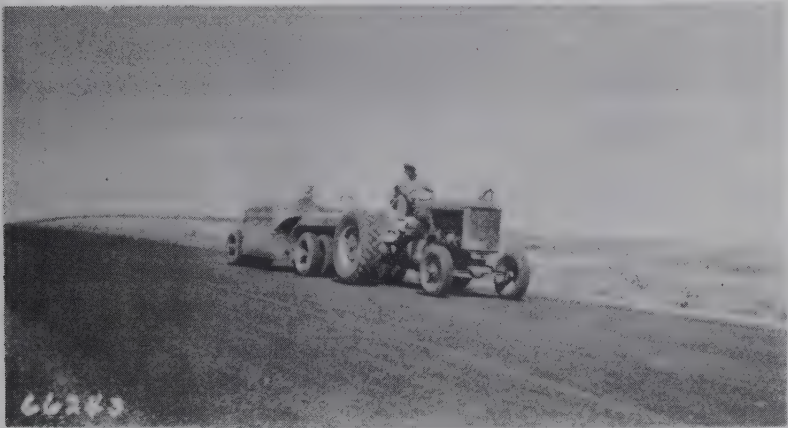
Material ready for aeration and laying.



Stabilizer with asphalt trailer.



Tamping roller being used in compacting the first lift of stabilized base.



Pneumatic roller finishing compaction and surface of stabilized base.



Finished roadway.

Below are listed in tabular form the low cost soil asphalt and soil cement jobs constructed in District 18. It will be noticed that the cost per square yard includes base work only. This was done because of the large variation in rate of application of asphalt for

HIGHWAY	COUNTY	LIMITS	PROJECT	YEAR CONSTRUCTED
U. S. 287	Navarro	From 14 mi. S. E. Corsicana to Freestone County Line	C-122-2-3	1939
S. H. 205	Kaufman	From Terrell to Rockwall C. L.	SP-451-2-3	1939
S. H. 34	Kaufman	From Parvin to Kaufman	FAP 1031 A(3)	1941
F. M. 55	Navarro	From Purdon to S. H. 31	L-162-8-1	1943
S. H. 34	Kaufman	From Trinity River to 6.5 mi. Northeast (Sections)	M-173-2-15	1945
F. M. 429	Kaufman	From S. H. 243 to 0.9 mi. North of Blackjack	S-568 (1)	1947
F. M. 633	Navarro	From Powell to Elm Flat	S-380 (2)	1947
F. M. 667	Navarro	From Frost to Ellis C. L.	S-379 (2)	1947
F. M. 55	Navarro	From Silver City to Blooming Grove	S-381 (1)	1947
F. M. 641	Navarro	From Currie to near Rushing	S-382 (2)	1947
F. M. 85	Kaufman	From Mabank to Prairieville	S-427 (1)	1948
F. M. 246	Navarro	From Streetman to Birdston Cemetery	S-374 (5)	1949
F. M. 639	Navarro	From S. H. 22 to Emmett	S-571 (2)	1949
F. M. 642	Navarro	From F. M. 709 to Pursley	S-572 (1)	1949
F. M. 986	Kaufman	From Terrell N. E. to Rd. Int.	S-1236 (1)	1950
F. M. 987	Kaufman	From F. M. 148 to Kaufman	S-1237 (1)	1950
F. M. 988	Kaufman	From Peeltown to S. H. 274	R-751-3-4 & S-1240 (1)	1950
F. M. 1126	Navarro	From Barry to Emhouse	S-1340 (1)	1950
F. M. 639	Navarro	From Rush Prairie to Dawson	S-1341 (1)	1950
F. M. 639	Navarro	From Emmett to Rush Prairie	R-997-1-3	1950
F. M. 1142	Rockwall	From F. M. 548 E. to County Rd.	S-1301 (1)	1950
F. M. 1142	Rockwall	From 2.9 mi. E. F. M. 548 to S. H. 205	R-1016-4-1	1950
F. M. 1140	Rockwall	From F. M. 550 W. & S. to Heath	S-1299 (1)	1950

SOIL CEMENT

S. H. 34	Ellis	From 8.5 mi. E. Ennis to Trinity River (Sections)	M-173-1-13	1945
F. M. 637	Navarro	From S. H. 287 to 2 mi. E. of Tuckertown	S-1121 (2)	1949

Listed below in tabular form are the four higher type asphalt stabilization jobs on S. H. 24 and S. H. 121 in Collin and Denton Counties. The cost per square yard in this table includes cost of full crown with flexible base, stabilization work, and single asphalt surface. All of these projects were constructed over heavy black gumbo embankments. NOTE: The average per mile cost on these projects is \$37,500 or \$2.66 per square yard. To construct the same sections using six inches depth, 24 feet width concrete pavement in lieu of the six inch stabilized mat and single asphalt surface,

HIGH TYPE

HIGHWAY	COUNTY	LIMITS	PROJECT	YEAR CONSTRUCTED
S. H. 24	Denton	Little Elm Creek to Collin C. L.	F-756-11	1949
S. H. 24	Collin	Denton C. L. to S. H. 289	F-756-11	1949
S. H. 121	Collin	Denton C. L. to F. M. 720	F-1085-9	1949
S. H. 121	Denton	2.6 mi. E. of Elm Fork to Collin C. L.	F-1085-7	1949

surface treatment. Since the cost per square yard, including surfacing for the earlier jobs constructed were given in an earlier part of this report the cost of base work only for these jobs is omitted from the table:

LENGTH MILES	DEPTH STAB.	WIDTH STAB.	STAB. AGENT	SURFACE	MIXING MACHINE	COST PER SQ. YD. BASE ONLY
7.663	4"	34'	RO-3	0.5 Single	Blade Mixed	
5.562	4"	34'	RO-3	0.5 Single	Blade Mixed	
9.205	5" & 6"	30'	RO-3	0.4 Single	Plant Mixed	
2.382	6"	24'	RC-2	0.45 Single	P. & H.	
2.157	6"	24'	RC-2	0.3 Single	Blade Mixed	
3.303	5"	17'	RC-2	0.5 Single	Woods	\$0.48
2.964	4"	16'	MC-2	0.4 Single	P. & H.	0.74
2.473	4"	16'	MC-2	0.3 Single	P. & H.	0.75
9.840	6"	16'	RC-2	0.5 Single	Woods	0.69
3.268	4"	16'	MC-2	0.4 Single	P. & H.	0.69
7.709	4"	19'	RC-2	0.35 Single	P. & H.	0.52
2.723	4"	17'	RC-2	0.4 Single	Madsen	0.63
6.443	5"	19'	RC-2	0.4 Single	Madsen	0.71
2.036	4"	17'	RC-2	0.5 Single	Madsen	0.54
7.103	4"	19'	RC-2	0.5 Single	Woods	0.43
7.491	5"	19'	RC-2	0.5 Single	P. & H.	0.60
8.306	4"	19'	RC-2	0.5 Single	P. & H.	0.49
7.931	4.5"	19'	RC-2	0.45 Single	Woods	0.55
7.649	4"	19'	RC-2	0.4 Single	Woods	0.50
2.338	5"	19'	RC-2	0.4 Single	Woods	0.62
2.898	4" & 5"	19'	RC-2	0.4 Single	Barber-Greene	0.59
4.494	4"	19'	RC-2	0.4 Single	Barber-Greene	0.49
2.459	4"	19'	RC-2	0.4 Single	Barber-Greene	0.66

STABILIZATION

2.575	6"	24'	Cement	0.3 Single	Blade Mixed	
5.685	6"	19'	Cement	0.4 Single	Madsen	\$0.62

based on average prices bid for flexible base on these projects and concrete pavement prices bid in this District in 1949 would amount to \$3.41 per square yard or \$48,571.15 per mile.

These projects have only gone through one winter since completion. There were two severe freezes in February, 1951, where these roads were covered with two to three inches of ice for several days duration, and from which no apparent damage has appeared to date (March, 1951). Further observations will be made on these roads to determine their durability and cost of maintenance.

STABILIZATION

LENGTH MILES	SUB- BASE	DEPTH STAB.	WIDTH STAB.	STAB. AGENT	SURFACE	MIXING MACHINE	COST PER SQ. YD.
6.045	7' Gravel	6"	24'	RC-2	0.5 Single	P. & H.	\$2.80
2.084	7' Gravel	6"	24'	RC-2	0.5 Single	P. & H.	2.80
12.350	7' Gravel	6"	24'	RC-2	0.5 Single	Madsen	2.80
4.936	7' Gravel	6"	24'	RC-2	0.5 Single	Madsen	2.23



Gus Henderson Retires . . .

Gus Henderson, employed by the Texas Highway Department for 24 years, has recently retired from his position as Core Driller for Materials and Tests Division.

Mr. Henderson met many employees of the Department as well as contractors and their employees in his work. Through these contacts, he has made many friends over the state.

During his 22 years as Core Driller, Mr. Henderson drove three core drill trucks a total of 388,000 miles, or approximately fifteen times around the earth at the equator. During this period, 72,000 cores were taken.

Born in Copenhagen, Denmark, in 1883, Mr. Henderson received his naturalization papers in San Francisco. These records were destroyed in the earthquake and fire there, so he had to obtain new papers. Mr. Henderson served under the Maritime Commission before coming to Austin.

We understand that he will continue to reside in Austin.

GRID ROLLER

H. W. HASS

Senior Resident Engineer

This concerns the results obtained by the use of a grid roller which was recently demonstrated during the construction of F. M. Highway 1351, Project R 691-3-1, Goliad County. The roller was used in lieu of a sheepsfoot roller to process and compact loose pit-run caliche, which was used as the base course for the project.

The caliche pit, located within the project limits, was excavated with a one and one-half cubic yard shovel to a depth of approximately ten feet. The top six feet consisted of soft but lumpy caliche, and the bottom four feet of coarse sand and some hard layers of sandstone. This material, after being thoroughly mixed and processed on the road, resulted in a mixture having a P. I. of 8 to 10 and a soil binder of 35 to 50 per cent. The caliche was dumped at the rate of 50 cubic yards per station.

After the caliche was dumped on the subgrade the grid roller, which was pulled by a D-7 Caterpillar Tractor with a dozer attachment,

was used to knock down the piles and to crush the large lumps preparatory to the mixing operation by a maintainer. This operation usually required three to four rounds by the roller which left the material in good shape to start cutting out to the sides by the maintainer. While cutting the material out to the sides, the grid roller was used behind the maintainer to crush the large lumps that were inside and in the bottom of the piles of caliche.

After all material was cut out from the center to the sides, it was then brought in across the subgrade in uniform layers with the grid roller following the maintainer. During the operation the grid roller was still crushing oversize material and compacting the base at the same time. Two pneumatic rollers followed the grid roller for further compaction.

In order to describe the grid roller further, the following data on the roller used on this project is listed for your information:

DRUMS:

Outside diameter
Width each drum
Interval between drums

67"
32"
6"

GRIDS:

1 1/2" bars on 5" center
Heat treated alloy steel
Net opening 3 1/2" x 3 1/2"

WEIGHT:

Grid roller (without weights) 9,400 Lbs.
Counter weights (inside drums) 5,000 Lbs.
Scrap iron (in counter weight box) . . . 9,400 Lbs.
Total Weight 23,800 Lbs.



Caliche dumped on prepared subgrade.



Material after one round with Grid roller.



After two rounds with roller.



After two and one-half rounds.



After four rounds.



Roller in operation during compacting process.



Compaction almost completed.



Completed base.

From the records kept on this project, it was found that approximately eight hours of grid rolling were required to process and compact one mile of base, or approximately one hour per 330 cubic yards of material. In comparing this with previous projects with similar base material, and where a sheepsfoot roller was used, it was noted that the grid roller did the job in approximately one half the time required by the sheepsfoot roller. No sledging was required on this project even though some of the large lumps of sandstone were difficult to break with a sledge hammer.

The contractor on this project noted a marked decrease in the

number of flat tires on pneumatic rollers usually resulting from working this type of rocky material. This was probably due to the ability of the grid roller to break up the large pieces and mash the smaller pieces into the base much faster than the sheepsfoot. The maintainer operator on this project also stated that he could set up more of this type of material by using the grid roller since it could break up and process the material faster than the sheepsfoot roller.

The photographs were taken during construction of this project illustrating the operation of the grid roller during the processing and compacting of base material.



"He says our bermuda grass has escaped from the right of way."



TENNANT JOINT CLEANING AND GROOVING MACHINE

R. W. TUCKER

Assistant District Engineer

Several months ago District 5 received a Tennant Joint-Cleaning and Grooving Machine. The unit is powered by a 13.3 HP air cooled engine and equipped with self-starter, generator, and storage battery. The manufacturer is the C. H. Tennant Company of Minneapolis.

The machine's high speed cutting action is provided by a series of four inch alloy steel cutters loosely mounted on a cutting head which revolves at a speed of 2400 RPM. By changing the spacing of the cutters, joints from three-eighths inch to four and a half inches wide can be cleaned and regrooved. Maximum depth of cut is about one and one-fourth inches. A four and one-half inch wide cutter head with two inch alloy cutters set solid can be used for removing extruded bituminous material.

The primary purpose for which this equipment was purchased was to speed up our work in cleaning and filling joints where old concrete pavement has been covered with hot mix asphaltic concrete. However, we have cleaned and grooved a few concrete joints very satisfactorily. Where concrete pavement has been widened with flexible base and covered with hot mix asphaltic concrete, a longitudinal crack develops along the edge of the concrete pavement, and we have used the Tennant Machine to deepen and widen this crack enough to permit filling with asphaltic material.

In addition to the above, we have used the machine to cut and clean transverse joints where old concrete pavement has been covered with asphaltic concrete. Generally, these joints are irregular and very difficult to fill without



The wide cutter head is used for leveling, the narrow for grooving and cleaning.

cleaning and grooving. This is especially true where the joints have been filled with redwood, the highway is a three lane road, the middle lane for passing only, and the asphaltic concrete at the joint has become higher than the remainder of the pavement. Here the wide cutter head can be used

to level the raised and extruded material near the joint. However, we have done very little of this type of work to date.

The alloy steel cutters come in three sizes: two inch, four inch, and four and three-fourths inch in diameter, with the maximum depth of cut about one and a half inches. The small two inch size is used for leveling only while the larger sizes are used for cleaning and grooving. At the present time the cost of the four inch size cutter is approximately \$1.08 each and the two inch size is approximately 20 cents each. The life of the cutters vary with the type of work being done, lasting a much longer time when cleaning joints than when grooving either concrete pavement or joints covered with hot mix asphaltic concrete. It is estimated that six four-inch cutters will cut and groove sixteen joints to a depth of one and one-fourth inches and many more joints to a depth less than one and one-fourth inches. For leveling high joints similar to those shown in the pictures submitted herewith, it takes approximately 108 two-inch cutters to level twenty joints.



Before leveling.



After leveling.

Joint had been cleaned previously.



Before grooving



After grooving.

Crack along the edge of old concrete pavement which has been widened with flexible base and covered with hot mix.



Joints after cleaning and grooving.

Below are some "Before" and "After" photographs of park work that has been done in this area. These parks have been constructed under the roadside development program.

ROADSIDE PARK ONE MILE SOUTH OF MULLIN, MILLS COUNTY



Before - September 11, 1950



After - Underbrush cleared, trees pruned and thinned, and a table unit installed.

Two views showing how bottle openers have been provided at some of the new arbors. In the bottom picture, a black ring has been painted around the opener. Both pictures were taken in District 7.





Before - Brush arbor at intersection of U. S. 87 and S. H. 158 three miles west of Sterling City. Looking south. July 14, 1950.



After - Larger and roomier masonry arbor replacing the smaller one. Note the fireproof covering. April 10, 1951.

PRESERVATION OF TREES

BEN J. LEDNICKY

Senior Landscape Advisor

The terms "Roadside Development," "Highway Beautification," "Landscaping," and others are accepted terms by all employees of the Texas Highway Department, but there seems to be many different conceptions of what the phases of work comprise.

To my mind, in roadside development as in any other landscaping problem, there must be two essentials, a lawn or setting, and trees. Anything beyond these two essentials is "window dressing." The lawn or setting for our highways is the area from the shoulders to the right of way line. By one means or another, vegetation can be established on our highways, thereby fulfilling requirement one. Flowers and shrubs alone will not give the desired restfulness that shade trees give. These colorful spots are welcome and attractive, and are necessary to complete the pattern, but essentially are only window dressings on our highways.

All of us are familiar with the planting programs of the 1930's and we can see many grotesque reminders of this era. The growing of trees is slow and costly, and much consideration must be given to planting in areas or locations even where they are clearly warranted. From experience and study it has been found that for an immediate effect, the most eco-

nomical method, and the most pleasing appearance, we must preserve existing trees in the initial stage of construction. The marking of trees for preservation prior to construction operations assures the traveling public of comfort, beauty, and safety on the highway, which spell the difference between a monotonous connection between two points, and a scenic route.

On any highway that has been cleared from right of way line to right of way line, it is difficult to overcome the monotonous uniformity, and no amount of window dressing will rescue it. On a highway where trees have been preserved - a primary requisite - grass, another requisite, can be established; then with the addition of the right amount of window dressing in the form of planting flowers and shrubs, this section of highway will become more picturesque with the passing of years.

The pictures clearly indicate the small expenditure involved in preserving trees as compared to the cost of planting them. You will note the number of years that are required before a tree is large enough to have an effect. Also, note the difference in the appearance of the highway where trees were preserved and where they were planted.



Two inch Live Oak planted February, 1951, at a unit cost of \$9.26. Brown County, U. S. 84.



One and one-half inch Live Oak planted April, 1935, at unit cost of \$2.17. Brown County, U.S. 84.



Live Oak and Sycamore planted March, 1937. Coleman County, U. S. 67.



Crew on new location placing a band of white paint on trees to be preserved during construction. Crockett County, Ranch Highway 33.



Live Oaks preserved on 60-foot R. O. W. Mills County, F. M. 573.



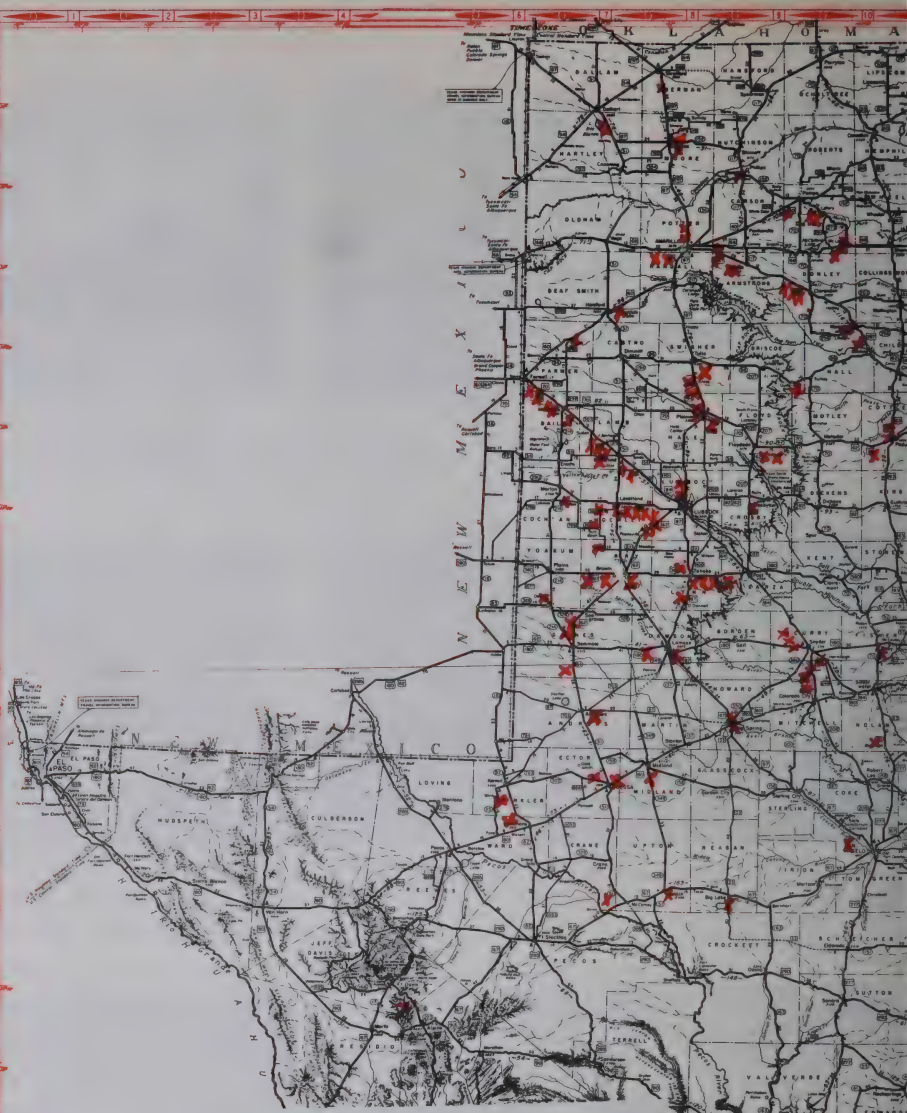
An "Oldtimer" that was preserved. Menard County, S. H. 151.



A welcome sight in an area of small growth. Sutton county, U. S. 290



Live Oaks preserved in 1930, prior to formation of Landscape Division. Brown County, U. S. 84.



TEXAS AUTOMOBILE INSURANCE SERVICE OFFICE

POST OFFICE BOX 57
AUSTIN, TEXAS

April 3, 1951

A. B. COCHRAN, Jr., Manager
Automobile Underwriting
R. W. RICHETTE, Assistant

Mr. D. C. Greer, State Highway Engineer
State Highway Department
Austin 14, Texas

Attention: Mr. J. A. Waller, Chief Engineer
Construction and Maintenance

Dear Sir:

Your File B-16

It has taken longer to collect definite information on insured losses due to broken windshields and headlights caused by flying gravel than it was first thought would be necessary. It is with regret that the survey was delayed so much, although it is hoped that the information which has been collected will be of certain value in your efforts to cope with the problem.

The enclosed map is thought to be reliable because enough losses were actually reviewed to permit intelligent sampling over the entire State. It shows the locations of high frequency occurrences. Whether repaving and resurfacing operations were being conducted at the time will be reflected in your records. The period under review was for the months of June through September, 1950.

A number of companies have written in that, although a definite check was impossible to determine how successful individual records were, it was known that there was a reduction in losses during the year 1950 as compared with 1949 in proportion to the number of automobiles insured. The increased cost of one-piece, curved windshields was recognized, and the frequency of such losses is still high. However, certain methods employed by your Department have been observed and commented upon. You might be interested to know that among those noticed particularly were more flagmen, better posted warning signs and the handling out of slips of paper to motorists as an additional warning upon entering a repair zone. All have expressed an appreciation for your efforts and we offer again many thanks for your very generous cooperation.

Very truly yours,

[Signature]
Acting Manager

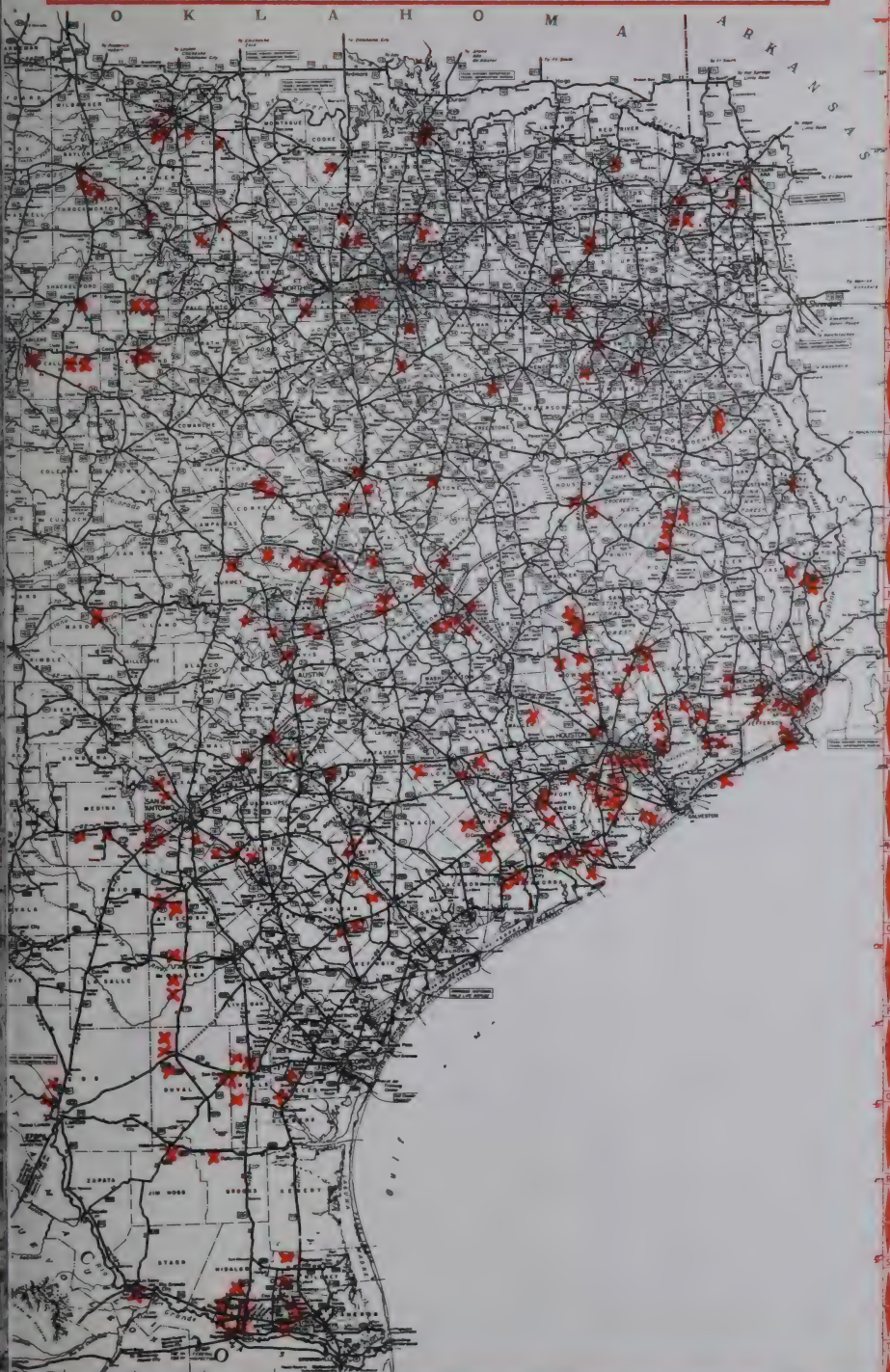
RH:WT
cc: Mr. J. P. Gibbs, Casualty Insurance Commissioner

SAMPLING CHECK OF BROKEN WINDSHIELDS

DUE TO FLYING GRAVEL

JUNE 1 - SEPTEMBER 30, 1950

Refer to Bulletin #1 for 1949 losses.



Tennant Grooving Machine

W. W. FINLEY

District Engineer

The Tennant Grooving Machine was purchased in February of 1950, and has been used for cutting and cleaning expansion joints, dummy joints, and routing out cracks in concrete pavement in preparing these joints or cracks for sealing with asphalt or one of the joint sealing compounds. The machine was used approximately 200 hours during 1950 on S. H. 183 in Tarrant County between its intersection with S. H. 199 and its intersection with U. S. 377 just north of Fort Worth, on U. S. 81 from the south end of the North-South Expressway south to the Johnson County line, on S. H. 199 from Twelfth Street in Fort Worth northwest to Lake Worth, in Erath County on U. S. 67 from Stephenville to Dublin, and in Wise County on U. S. 81 from the south city limit of Decatur to a point five miles south.

When purchased, the machine was mounted on a single axle with pneumatic tires with guiding and depth of cut controlled by the operator using the typical plow handle arrangement shown in the attached pictures. A series of cutters were mounted in a revolving head immediately in front of

the axle. The cutters extend only a short distance beyond the face of the head. When we first began using the machine it was found that the operator had a great deal of difficulty in keeping the revolving head from grinding on the surface of the pavement. In fact, we damaged two or three heads before it became evident that the operator could not become sufficiently skilled to balance the machine with the revolving head held the necessarily small fraction of an inch off of the concrete surface. Since these heads cost over \$50 each, it became necessary to install an adjustable caster wheel on the front of the machine by which the depth of cut may be adjusted. Having fixed the depth of cut the operator can then give his full attention to keeping the machine moving at the proper speed and in line with the groove to be cut. In the attached pictures 1 and 2, you will note that a mirror mounted above and to the front of the machine permits the operator to see the groove to be cut and to keep it in line with the bright metal marker on the front of the machine.

Since the installation of the



caster wheel we have not had to replace a cutter head. It has been found economical, however, to have an extra cutter head fitted with cutters to avoid delay in mounting cutters. In operating steadily during the day it will be found necessary to install several sets of cutters. It is, therefore, advantageous to have someone make up a head with cutters and have it ready for installation. The installation of the head with the cutters already mounted requires not over four minutes. We note that the need for the additional caster wheel to control depth of cut has become obvious to the manufacturer and has been added to the machine as indicated in the January, 1951, issue of Construction Equipment magazine.

We are currently cutting and resealing joints and cracks on 32

miles of concrete pavement, and this machine is a vital feature in this program in that it is economical to operate, takes the place of several men doing hand work, is rugged and efficient, and may be adjusted to clean wide expansion joints or narrow grooves. It should be borne in mind that a head set up with several cutters to cut expansion joints cannot be used to cut the narrow construction joints. A series of wide joints must be cut, then the head changed for narrow grooves, and the length of the section re-cut.

Pictures 3 and 4 show the left side of the machine and the groove as cut before being cleaned with an air blast. Examination of picture 4 will show the clean effect in and along the edge of the groove. This makes adherence of the sealing compound more effective.



Bridges . . .

Subject: Lowering High Handrails of Concrete
Bridges on F.M. 78, from W.W. White
Road to Randolph Field in Bexar County

The handrails of these 20 foot roadway bridges had nearly all been damaged to some extent by various types of vehicles, therefore, it was deemed advisable to lower them at this time rather than to repair them according to their original design. This highway carries a considerable amount of traffic between San Antonio and Randolph Field.

We had salvage concrete rails on hand and used them to raise the curbs of the bridges, as will be noted in the snapshots. This additional curbing will serve the purpose of a guard rail, yet will not interfere with the wheels of vehicles since it is offset toward the outside from the original curbing.

Shown are "before" and "after" snapshots and sketches of the rail revision of the bridges.

*Submitted by R. L. Faltinson
District Engineer*



Structure 2.20 miles west of
Randolph Field gate on F.M. 78.

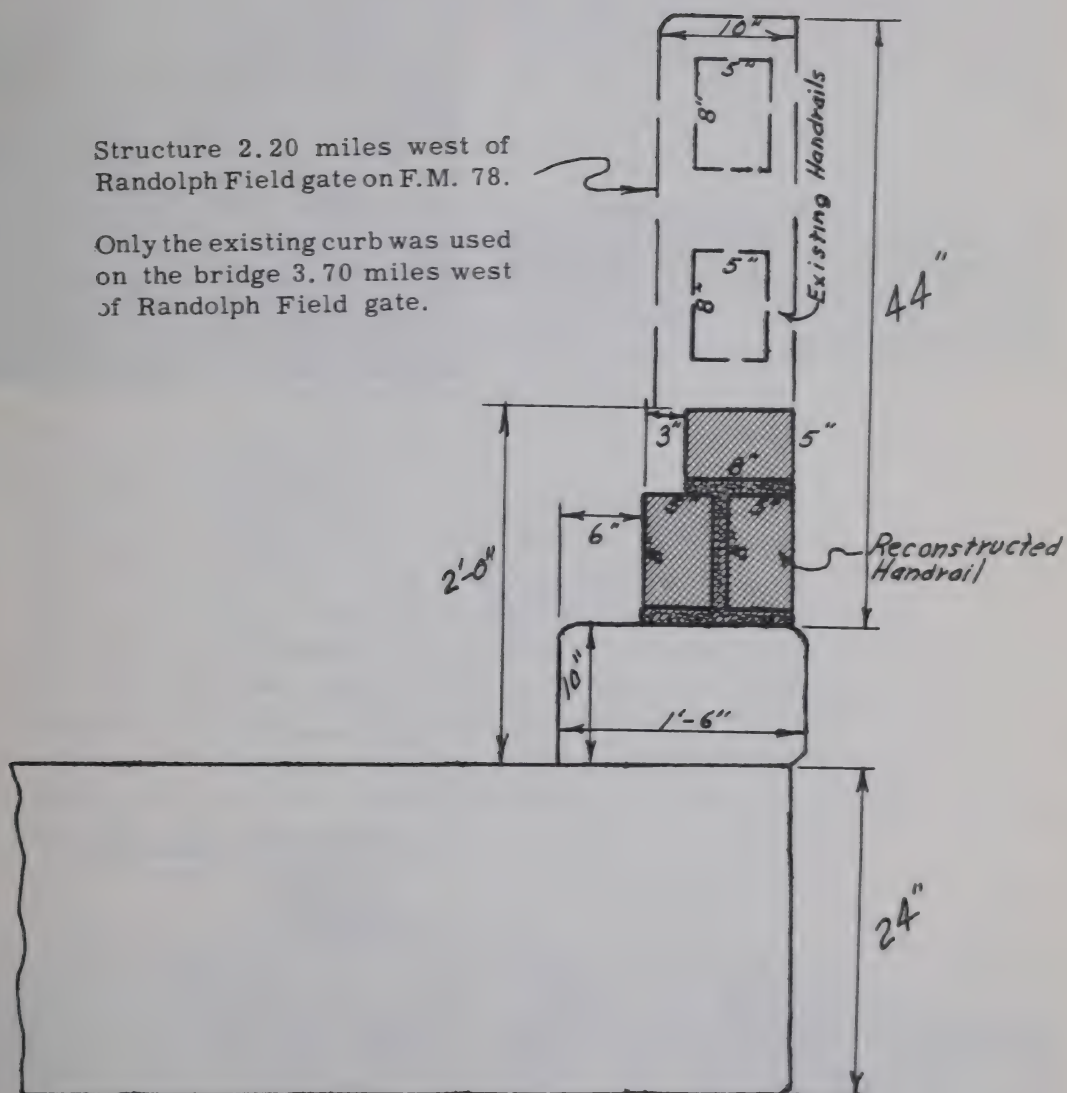


Structure 3.70 miles west of
Randolph Field gate on F.M. 78.



Structure 2.20 miles west of
Randolph Field gate on F.M. 78.

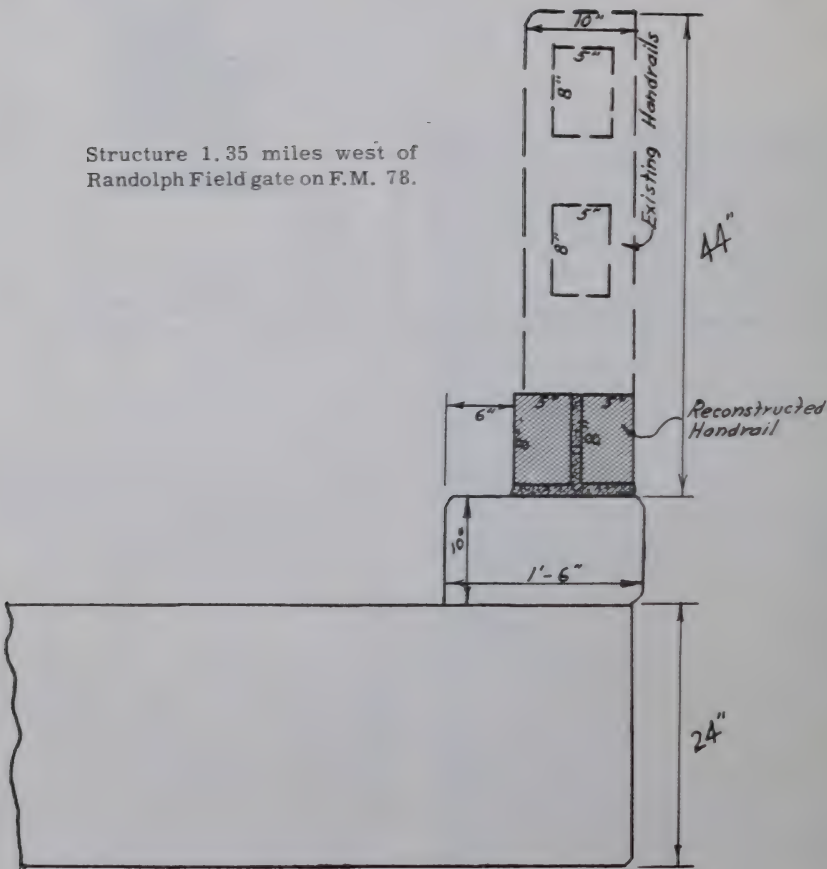
Only the existing curb was used
on the bridge 3.70 miles west
of Randolph Field gate.



Structure 1.35 miles west of
Randolph Field gate on F.M. 78.



Structure 1.35 miles west of
Randolph Field gate on F.M. 78.



Spot Leveling Blade

R. N. JENNINGS

District Maintenance Engineer

It has been found that certain conditions of roughness in pavement can be corrected more cheaply by spot leveling with hand methods than by utilizing machine methods. The unit cost of material placed runs considerably higher when placed by hand due to higher labor cost but a small amount of material can accomplish very good results.

A hand machine has been developed by Jim Butler, Section Foreman at Garden City, to lower the cost of the preliminary leveling of the asphaltic material used. This machine consists of a six foot grader blade with two small dolly wheels and two shaft handles. The wheels and shafts are made with flexible joints to permit easy maneuverability. Elevation of blade is adjusted by raising or lowering handles. The blade is used only to spread the material as final leveling is done with a standard straightedge.



Cutback asphalt spread thinly by brooming.



Leveling material roughly spread by shovel.



Machine spread to right.



Machine levels out small windrows.



Final leveling with straight edge.



WEST TEXAS GAS COMPANY

GENERAL OFFICE, LUBBOCK, TEXAS

C. H. LACKEY
MANAGER, LUBBOCK DISTRICT
DRAWER 1121, LUBBOCK, TEXAS

May 4, 1951

Mr. D.C. Greer, State Highway Engineer
State Highway Department
Austin, Texas

Dear Sir:

The attached note was handed to me by a very pleasant young man after flagging me down at a highway intersection a few miles south of Stephenville last week.

You are probably more familiar than I with the inward feeling of disgust with which a motorist approaches a barricaded highway. In this instance, the young man soon dispelled my fears of a long and dusty detour by the very pleasing manner by which he explained the work in progress.

I wish to take this opportunity to express my sincere appreciation for the fine manner in which you have built and maintained our present fine system of highways.

With continued best wishes, I remain,

Yours sincerely,

CHL/cc

Clinton H. Lackey



Cycle Mowing Machine

J. B. NABERS

District Engineer

One of the most vexing problems of the Maintenance Foreman during the summer months is the control of weeds and grass at culverts, bridge approaches, and similar places. This problem is at least partly solved in District 3 by the use of small cycle mowing machines.

The machines are light enough to be lifted in and out of a truck by two men, but will cut a 36 inch swath of bermuda grass or heavy weeds about as fast as a man can walk. They are powered by a one and one-fourth horsepower gasoline motor connected to the wheels and cycle bar by V-belts. The front end is enclosed by a hood to prevent grass from clogging the belts.

The principal advantage of the machine is its maneuverability. It will work close to guard posts or other obstructions without loss of time. Some hand cutting is usually done to avoid loss of machine time immediately adjacent to obstructions. It has the serious disadvantage of frequent breakdowns. This is because of the inability of the lightly constructed machine to withstand the constant vibration.

The pictures illustrate the machine and results of two rounds of mowing at a bridge approach.





COMMISSION

E. H. THORNTON, JR., CHAIRMAN
FRED A. WEMPLE
ROBT. J. POTTS

TEXAS HIGHWAY DEPARTMENT

Atlanta, Texas

May 24, 1951

STATE HIGHWAY ENGINEER

D. C. GREER

Accidents Involving State Owned Equipment

FILE NO.

To: Messrs. Youngs, Johnston, Ross, All Resident Engineers
All Maintenance Foremen

Our Austin Office is becoming rather alarmed at the overabundance of accidents that have been happening where State owned equipment is involved. We have been rather fortunate in this District due I believe to the stress we place on safety and to the care exercised by drivers of all State owned equipment. We possibly have been lucky in one sense but continued good records in this regard are not usually attributed to luck.

We have been lax, however, in reporting accidents involving State owned equipment and also lax in investigating these accidents after we hear about them. The Construction and Maintenance Bulletin No. 4 which was the January issue of this year covered this matter in detail and was written by the Equipment and Procurement Division. I should have immediately followed this up with a definite plan and will outline it to you now with your utmost cooperation being sought to comply with same.

Any accident that occurs in your Residency or your Section involving State owned equipment regardless of whether the property damage is small or large should be reported immediately to me. Please start doing this at once. If the equipment involved is engaged in maintenance work, I will then turn the matter over to Mr. Johnston and Mr. Ross to serve as a committee of two acting with the supervisor in the Section where the accident occurred to make a thorough investigation of the accident and report back to me. If the State equipment that might be involved is on construction work in one of our Residencies, I will turn the matter over to Mr. Youngs and Mr. Ross to serve with the Resident Engineer involved such that they can report back to me on same. I want these investigations to be made in an unbiased and impartial manner and want them made just as soon after the accident has happened as is possible.

These investigations and reports if carried out the way they should be carried out will possibly focus our attention on drivers of equipment who possibly are careless or contribute to bad accident records, and will at the same time focus our attention on our personnel who should be highly commended for allowing us to continue the splendid record we have attained in this District.

Sincerely yours

E. B. Bluestein
Ed Bluestein
District Engineer

EB:mjw

cc: File D-4

BN: to D-4: This answers your letter of May 22, 1951, your Bulletin 47-51.



COMMISSION

E. H. THORNTON, JR., CHAIRMAN
FREDA WEMPLE
ROBT. J. POTTS

TEXAS HIGHWAY DEPARTMENT

Amarillo, Texas
June 2, 1951

STATE HIGHWAY ENGINEER
D. C. GREER

FILE NO.

TO ALL SUPERVISORY EMPLOYEES
DISTRICT SHOP
ALVA CHAMBERS
R. C. LILES
J. M. HARRIS
DEE LEHMAN
MISS EUNICE BEST

Gentlemen:

Due to numerous accidents involving state equipment and as per instructions from the Austin office, there is hereby formed a permanent district accident review committee composed of the following members:

J. M. Harris
J. S. Gaines
Dee Lehman
W. A. Riney and
Miss Eunice Best

This committee is to investigate and analyze each and every accident involving state equipment, and will report in detail to the undersigned with reference to the responsibility of the operator of the affected equipment concerned.

I wish that each and every supervisory employee would discuss our accident record with each and every employee with a view of eliminating some of these accidents.

Jim Harris will act as chairman of this committee and Miss Eunice Best as secretary.

Your usual earnest consideration of the above will be appreciated.

Very truly yours,

James G. Lott
James G. Lott
District Engineer

JGL:eb

P. S. You of course will notify this office immediately in the case of an accident involving state equipment, and send the necessary reports at the earliest possible date.

A Combined Single Unit Asphalt Stripe Machine

J. K. NASH

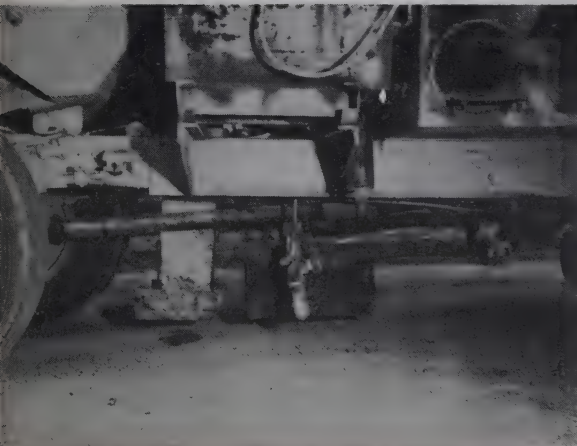
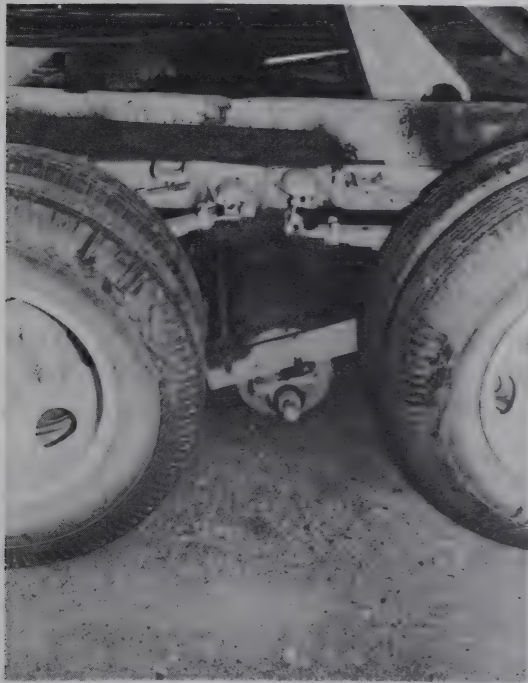
Shop Foreman

The District 14 Shop was asked to consider constructing an asphalt stripe machine that would embody the following features: (1) a 500 gallon asphalt booster tank, (2) an asphalt pump, (3) a spray bar, (4) a rock spreader box with a capacity of five cubic yards of cover stone, and (5) a roller, all combined into a single self-propelled machine which could be handled by two men, an operator and a driver. At the time this seemed a pretty large order, but after considerable thought such a machine was constructed and is now in operation in this District. The principal construction details are briefly outlined below.

In order to keep the cost down as low as possible on an experiment of this kind, salvaged materials and parts were used wherever possible. A one and one-half ton long wheel base truck, which was completely depreciated, was selected as the basis for this machine. The frame was extended four feet and a dual wheel axle mounted to the frame with the rear wheels set so that they would contact the road only when loaded. This prevents excessive tire wear

while traveling empty and in turning movements. Since the load carried by this machine is approximately 18,000 pounds, the truck frame was boxed and cross members added to handle this excessive load.

Since no suitable material was available for the construction of the asphalt booster tank, this item was the most expensive single part of the unit. The 2'x6'x6' tank was constructed of one-fourth inch black iron fitted with heating flues, baffles, and a capped man-hole in the top of the tank. The tank was mounted immediately behind the truck cab. For inspection and filling, a ladder was constructed on the side of the tank. A four inch burner is used for heating and fuel is supplied by fuel pump driven by the asphalt pump engine. A five H. P. gasoline air-cooled engine with a ten to one chain sprocket reduction is used to drive the asphalt pump. The reduction is used to allow a constant engine speed at all times and to aid in keeping a cool engine. On the burner side of the tank a thermometer well was inserted. The spray bar is a full circulating type using a rotating drilled sleeve



valve for the stripe, and a pressure gauge is used on the bar to keep constant pressure at all times. The quantity of asphalt and pressure is controlled by a series of valves in the asphalt line. The spray bar is adjustable for constant height and can be moved up or down while in use. The bar may also be raised when transported.

The spreader box is ten inches back of the spray bar, which is as far away from the spray bar as we consider desirable in order to get full coverage on the stripe. Inside the spreader box a series of baffles were placed to provide a uniform flow of cover material and to prevent waste, but at the same time, leave a clean, well-covered, center stripe. The spreader box folds up out of the way when not in use. A reverse dump body with a chute in the front end which fits into the spreader box when the body is raised was mounted on the truck chassis to supply cover material to the spreader box. In order to prevent the spilling over of rock when the dump body is in operation, the sides and front end were raised. The inside of the dump body was constructed to direct the flow of rock to the outlet where a valve door controls the flow of rock through the chute to the spreader box. When the dump body is raised, two hinged legs mounted on the sides at the rear of the bed move into place supporting the body in a fixed position and eliminating any twist or undue strain on the hinges and truck frame.

The roller, twelve inches in diameter and thirty inches long, is mounted on a ball bearing pillar block in a frame. It is loaded with split shot, and weighs 650 pounds. This roller is mounted directly behind the spreader box, and can be cranked up to a locked position when not in use.

The asphalt operator's seat is on the outside of the truck frame between the asphalt tank and the dump body. All controls and gauges are in easy reach and vision of the operator. A plumber's friend speaking tube is provided from the operator to the driver for ease in giving instructions. To prevent truck exhaust gases from affecting the operator, the exhaust pipe and the muffler are carried out and up the side of the booster tank. A muffler is also provided for the pump engine to reduce noise, making conversation easier between the operator and driver.

The tachometer unit is mounted under the left running board with a drive cable routed up through the cab and the tachometer head mounted in direct line with the guide bar so that both may be seen at the same time. The tachometer can be raised to a locked position when not in use.

A guide bar sixteen feet long was fabricated from $1\frac{1}{2}$ " x $1\frac{1}{2}$ " x $\frac{1}{8}$ " and 1" x 1" x $\frac{1}{4}$ " angle iron and is similar in construction to a drag-line boom. The rear end of this guide bar is hinged to the front bumper of the truck and the front end of this guide bar is supported by a twelve inch pneumatic-tired caster wheel. This guide bar is

adjustable both horizontally and vertically to permit adjustment for any type of road conditions that might be encountered. A unique type "V" rear guide sight is mounted on the dash with one side blinded. The driver keeps both eyes open but uses only one eye in lining up the rear sight and the ring sight on the tip of the guide bar. We find that this arrangement is more accurate and lessens eye fatigue. On the front end of the guide bar is a ten inch ring sight with cross wires mounted on a 30 inch adjustable upright pipe, permitting easy alignment of the front and rear sights with the center line points. The guide bar is light, sturdy, and easily

detached and carried on the side of the truck when not in use.

This machine is fast, handles well, steers easily, and places a clean, well covered stripe. The construction cost, exclusive of the truck was approximately \$2,000.

Although this machine was built primarily to replace or renew center stripe, I see no reason why it cannot be used exclusively for all center striping. With the proper arrangement of stock piled materials and the use of a front end loader with operator and booster tank, truck and driver wherever necessary, the exclusive use of this machine in all center striping would materially reduce our center stripe cost.

TWENTY-FIVE AND THIRTY YEAR AWARDS . . .



Front row: Peat O'Neal, E.W. Pile, P.B. Trevino, T.S. Watson, Jake Webb, G.F. Wingard, and J.M. Ziegler.
Middle row: Rufus Warren, Hazel Bergstrom, R. B. Blankenship, E. B. Calvin, L. C. Cleveland, M. J. Gonzales, and A. L. Hodges.
Back row: Harvey E. Deen, S. C. Dougherty, Jim Douglas, V. O. Ellis, O. C. Pierce, H. P. Stockton Jr., and W. E. Suter.

CAMP HUBBARD SHIPPING POSSIBILITIES

All Items in Stock

Sign Plates (steel)

Reflector Buttons, 3/4" Clear for wood
Stencil Board, 24" x 36" Sheets
Silk Bolting Cloth, 10 yard Rolls (10XX)
Blue Film (Rolls)
Adhering Liquid (1 gal. cans)
Bombshell Torches
Torch Wicks
Torch Hoods
Sign Spacers
Flag Stand Springs
Gasoline Safety Cans (5 & 10 gal.)
Sample Cans (3/4 gal.)
Sample Sacks
Squeegee Rubber (6 ft. Rolls)

First Aid Material (all items)

Safety Materials

Welding Helmets Type E
Spectacle Type Goggles
Goggles, Type A, B, C, D, & F

Lab. Supplies (all items)

Red Signal Flags (11" x 12")
Texas Flags (4' x 6' & 6' x 9')
U. S. Flags (4' x 6' & 6' x 9')
Red Flagging Material (Bolts)
Haul Tickets
Form 190 Tickets
Carbon Paper (Rolls)
Floor Brushes (16")
Asbestos Gloves
Welders Gloves
Broom Wire, 14"
Broom Wire, 20"
Right-of-Way Markers, Type 2
F. A. P. Markers
Fibre Washers, 5/16" & 1/2"

Roper Pump, No. 5, Size 3"

Signal Material

Signal Heads
Signal Controllers
Signal Cable
Signal Lens

Pruning Equipment

One Man Cross Cut Saws
Hand Pruning Shears
Lopping Shears
Pole Saws
Pruning Saws
Bark Scrapers
Tree Trimmers
Pole Saw Blades, 15" #4502
Pole Saw Blades, 16" #4402

Reflective Sign Material

Flat Top Silver Scotchlite, Rolls, 24"
Flat Top Yellow Scotchlite, Rolls, 24"
Wide Angle Yellow Scotchlite, Rolls, 18, 24, & 30"
Wide Angle White Scotchlite, Rolls, 18, 24, & 30"
Prismo Yellow Sign Kits
Prismo White Sign Kits
Prismo Yellow Binder Paste, (5 gal.)
Prismo White Binder Paste, (5 gal.)
Prismo Solvent (5 gal.)

Paints

AP-1 Alum. Paint (gal.)
BP-1 Black Ext. Paint (gal.)
BP-2 Black Stencil Paste (qts.)
BP-3 Black Eqpt. Enamel (qts.)
GP-2 Gray Eqpt. Enamel (qts.)
GR-3 Alum. Grease Paint (5 gal.)
RP-2 Red Signal Enamel (qts.)
WP-3 White Ext. Paint (gal.)
WP-4 White Stencil Paste (pts.)
WP-7 White Striping Paint (5 gal.)
YP-1 Yellow Exterior Paint (5 gal.)
YP-7 Yellow Striping Paint (5 gal.)
V-18 Spar Varnish (5 gal.)
Prismo White Striping Paint with Beads (5 gal.)
Beads, Center Striping
Paint Stripper
Mineral Spirits (5 gal.)
Toluene (5 gal.)
VM & P Naptha (5 gal.)
Replacement Linseed Oil (5 gal.)
Dry White Lead (25 lb.)
Zinc Dust, (25 lb.)
"Men Working" Sign Bracket Stands
Rubber Cones

Texas-Louisiana Interstate Bridge

ARNOLD B. STAUBACH

Senior Field Engineer

Photographs by G. L. Wiley, Welding Specialist

The Texas-Louisiana Interstate Bridge site is two miles north upstream from the present crossing in Orange. Construction was started on August 6, 1949, by Austin Bridge Company, Dallas, General Contractors. Structural steel is being fabricated in the Orange plant of the Consolidated Steel Company and transported to the site by barges. The bridge was designed and is being constructed under the supervision of the Texas Highway Department. C. H. Brown of Orange is Senior Resident Engineer and W. E. Simmons, Beaumont, is District Engineer. It is expected that the bridge will be completed late in 1951 or early in 1952. Roadway approaches on both sides of the river are now being constructed under the supervision of the Texas and Louisiana Highway Departments. It is hoped that the entire facility will be open to the traveling public early in 1953.

The bridge will be 3100 feet long, with two 26 foot roadways sepa-

rated by a 4 foot median and will have a 50 foot clearance over the main river channel. The approach spans will be on 3.5 per cent grade. The 1100 foot vertical curve over the main channel is in accordance with 60 miles per hour design speed. The design loading is H-20-S-16, in accordance with Interstate Highway standards.

The superstructure will consist of one three span continuous deck plate girder span 500 feet long over the main channel, flanked in each approach by 1300 feet of three span I-beam units. The substructure will consist of concrete column bents and piers supported on steel H-beam foundation piling. Principal quantities are 46,400 linear feet of steel foundation piling, 5,500 cubic yards substructure concrete, 4,100 cubic yards of superstructure concrete, 1,802,500 pounds of reinforcing steel, 3,925,700 pounds of I-beams, and 1,444,400 pounds of plate girders. The estimated cost is \$1,930,000 shared equally by the two states.





Substructure units under construction near east end looking east. Louisiana approach.



Substructure complete except one cap.



Substructure complete except one cap - looking east.



Columns of east main pier in place and forms for last cap in approach bents. Looking east.



View from ground showing steel erection near east end.



View from below showing steel erection and substructure of Texas approach across river.



View on top showing steel erection.



View on top showing welding operations.



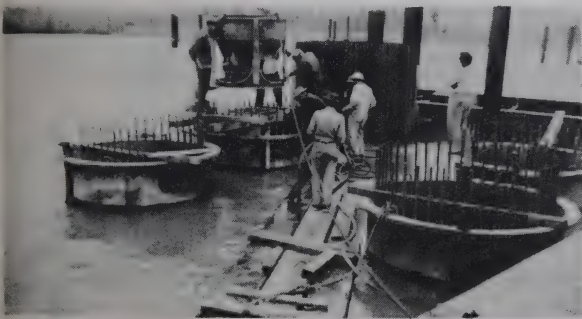
View on top showing erection equipment.



View showing setting of I-beam stringers. # 7



Superstructure steel transported from plant on barges.



Concreting of footings for main piers.



General view of substructure from concrete batching plant on west bank of river.



View of substructure from top of Louisiana approach. Base of east main pier in foreground.

CUMULATIVE TOTAL OF CENTER STRIP

AS OF

DISTRICT NUMBER	PAINT STRIPE	ASPHALT STRIPE	TOTAL COST	GALLONS OF PAINT USED PER MILE	PAINT STRIPE TOTAL MILEAGE
1	6,562.63	6,064.63	12,627.26	18.50	59.79
2	4,856.13	14,534.11	19,390.24	18.30	45.53
3	3,963.26	10,570.46	14,533.72	12.44	35.77
4	3,473.89	20,513.32	23,987.21	16.10	25.10
5	9,611.48	19,941.22	29,552.70	15.70	118.76
6	579.53	9,413.39	9,992.92	17.80	5.34
7	8,588.00	21,660.00	30,248.00	12.03	87.66
8	*12,235.58	24,897.53	37,133.11	10.20	61.99
9	7,609.38	9,523.56	17,132.94	16.30	66.25
10	10,714.83	5,869.83	16,584.66	15.72	132.60
11	4,817.47	5,204.39	10,021.86	18.20	56.02
12	* 3,923.67	9,604.46	13,528.13	25.36	152.68
13	1,244.60	3,820.38	5,064.98	28.52	4.20
14	19,220.67	6,262.76	25,483.43	16.90	226.63
15	17,443.56	10,986.43	28,429.99	16.80	174.99
16	1,754.35	11,118.58	12,872.93	15.00	17.16
17	5,486.10	9,499.45	14,985.55	15.00	58.26
18	14,617.32	15,195.20	29,812.52	14.94	186.09
19	14,361.29	8,688.23	23,049.52	15.87	149.49
20					
21	4,087.76	1,026.26	5,114.02	16.32	30.02
22	2,889.59	2,939.56	5,829.15	17.61	25.15
23	7,987.43	2,511.37	10,498.80	16.00	99.14
24	4,530.67	6,200.46	10,731.13	13.65	47.80
25	2,132.23		2,132.23	13.80	16.32
172,691.42		236,045.58	408,737.00		1,882.74

No work performed in Districts 3, 7, 13, and 21.

*District 8 - \$6,682.30 covers cost of plastic markers.

WORK PERFORMED BY DISTRICT

MAY 31, 1951

ASPHALT STRIPE TOTAL MILEAGE	TOTAL MILEAGE	PAINT STRIPE AVERAGE COST PER MILE	ASPHALT STRIPE AVERAGE COST PER MILE
98.67	158.46	109.76	61.46
301.45	346.98	106.65	48.21
182.14	217.91	110.81	58.03
406.00	431.10	138.40	50.52
491.11	609.87	80.93	40.60
164.93	170.27	130.53	57.07
442.14	529.80	97.97	48.98
411.77	473.76	89.58	60.46
195.95	262.20	114.86	48.60
193.51	326.11	80.80	30.33
112.00	168.02	85.99	46.47
178.86	331.54	25.69	53.69
44.00	48.20	295.77	86.82
201.17	427.80	84.81	31.13
177.54	352.53	99.68	61.88
181.31	198.47	99.58	61.32
154.34	212.60	94.15	61.55
266.99	453.08	78.54	56.91
164.80	314.29	96.07	52.72
12.40	42.42	136.17	82.76
29.93	55.08	114.89	98.21
59.33	158.47	80.56	42.33
136.90	184.70	94.78	45.29
	16.32	130.65	

4,607.24

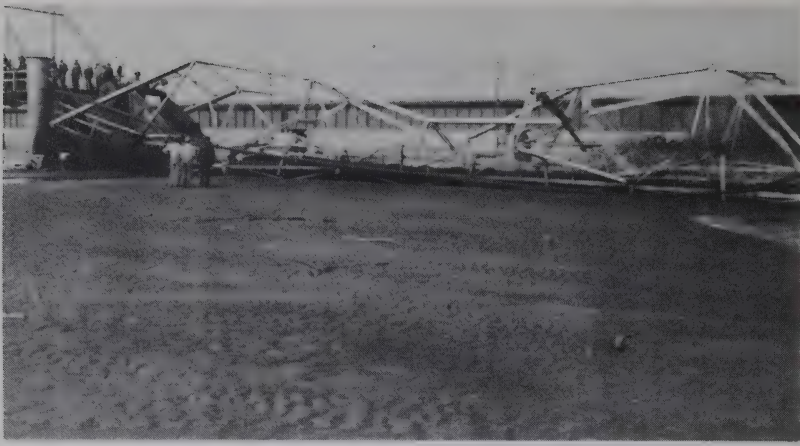
6,489.98

91.72

51.23

*District 12 - \$1,199.85 covers cost of plastic markers.

District 4, 6, 11, 16, 20, 23, and 25 did not submit a report for May.



DAMAGE TO CANADIAN RIVER BRIDGE U. S. HIGHWAY 83, HEMPHILL COUNTY

DESCRIPTION AND LOCATION:

Location: U. S. 83 at Canadian, Texas in Hemphill County.

Length: 3,291.5 feet (Twenty-one 153.5 foot steel trusses and two I-beam approach spans.

Roadway width: Fifteen feet.

Load rating: 12,500 pounds axle load.

CAUSE OF ACCIDENT AND EXTENT OF DAMAGE:

At 7:40 P. M. April 2, 1951, a Chevrolet truck towing a seventeen cubic yard Model S-152 Bucyrus Erie Scraper, moving south and driven by Mr. Roscoe Brown of Brown Brothers, pulled to the right to meet a truck and apparently struck one vertical and end post, collapsing and destroying the fifty span from the north end. The load was being moved under an overwidth permit number 140682.

There were no fatalities or serious injuries.

DETOUR:

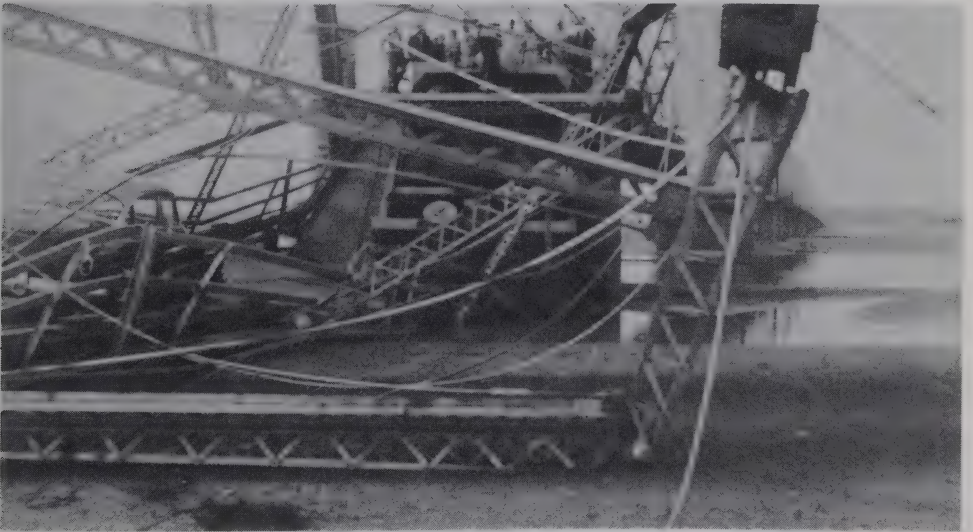
A detour has been constructed, and towing vehicles are in operation just downstream of the bridge.

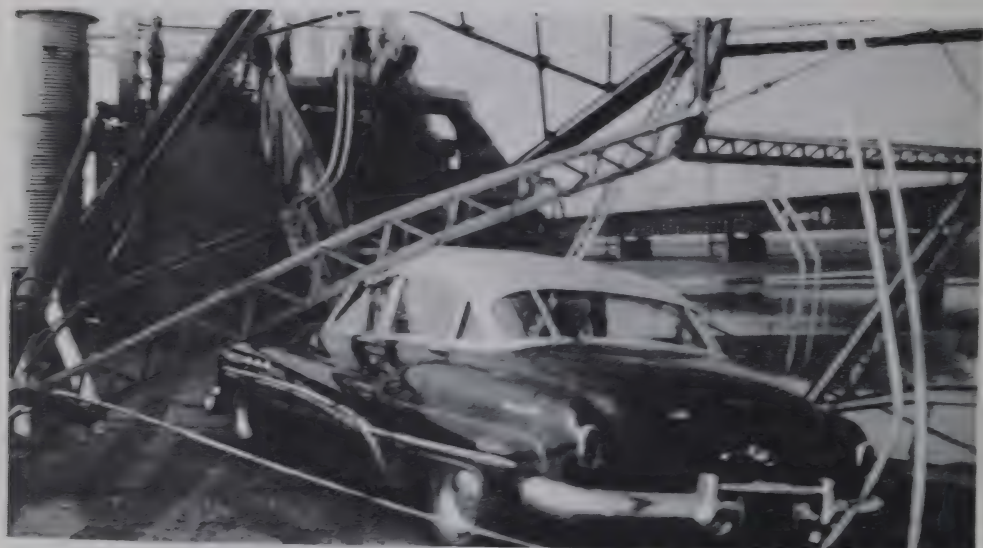
PROPOSED REPAIRS:

Install two 60 foot pony trusses and two I-beam spans on three piling bents in the gap. Roadway width and Load Rating will be the same as the original bridge. Heavy equipment to remove old truss and start repairs arrived April 9, and bridge is expected to be open on or before April 28.

ESTIMATED COSTS: \$30,000.

Brown Brothers have been notified that they will be billed for cost of repairs.









CEMENT STABILIZATION OF SHOULDERS AT BRIDGE ENDS

R. L. FALTINSON

District Engineer

The following information concerning cement stabilization of shoulders at bridge ends describes the type of work done at a bridge one mile south of the intersection of U. S. Highway 181 and the 181 Business Route, south of Floresville.

The subgrade was prepared by hand, although where the equipment is available and it is practical to use at the job site, it is recommended that a maintainer be used in preference to hand methods. This of course would necessitate the removal and replacement of the guard posts, which would be worthwhile.

Sandy caliche gravel with about 17 per cent metal and a Plasticity Index of seven, and an addition of two bags of cement per cubic yard were used. The quantity of cement would vary with the type of material used. Mixing was done in a regular concrete mixer and the mixture placed to a depth of 3 1/2 inches.

Before this work was done in the spring of 1950, there was a rank growth of weeds and grass on the shoulders, and now one year later, the shoulders are clean and in good condition. The traffic hazard of rutting along the edge of the pavement has also been eliminated.

Although this work was done on an experimental basis in this District, it has proven to have definite value, and we are planning to do more of this type of work when possible.





Before and After pictures of cement shoulder stabilization at bridge ends on U. S. 181 one mile south of intersection of U. S. 181 and Business Route south of Floresville.



To the Governor
State of Texas

. . . We've driven across Texas from the West the last few days. We camped at roadside parks, finding them with map given us by The Highway Department.

We didn't want to leave Texas without saying thanks for ourselves and for thousands of other tourists who probably never take the time. The fine parks are a great help to those of us who prefer to camp and eat in the great out of doors.

Lt. B. H. Demey
Q. M., Center
Fort Lee, Virginia



. . . I want to take this opportunity to congratulate the Highway Department on the fine system of highways in Texas. I have occasion to do quite a bit of driving outside of Texas and it is always an inspiration and a relief to get back on good Texas roads.

I also want to commend the Highway Department for the fine system of marking the highways and I think the Highway Department is doing one of the best jobs of any State Department,

O. P. Schnabel
San Antonio, Texas



. . . Your highways are excellent and generally well marked for convenience of tourists and safety of drivers. Why don't you be realistic and set maximum speeds consistent with your roads and the speeds allowable and practiced on them by both Texas and touring drivers?

C. F. Tuttle
Sebastopol, California



. . . We have received the travel literature and highway maps for the state of Texas for which we wish to thank you and we assure you that our employees who will be vacationing through Texas will very much appreciate this service.

We certainly admire the clever folder you have prepared for those who wish to travel through Texas and we know it will be of great value and convenience for all who are privileged to use it.

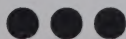
Charles Kerr
The Hobart Mfg. Co.
Troy, Ohio



. . . I would not feel right if after traveling across your great state by auto from entrance in Arizona to the exit into Louisiana, as my wife and I have done, without commending your department for the generally excellent roads and particularly the very splendid system of marking directions, and frequent road signs showing distances to points ahead. Those markings enabled us to proceed through Houston and other cities without a hitch.

More power to you!

Harry W. Barney
Clintonville, Wisconsin



. . . Undoubtedly yours is one of the more progressive states in the U.S.A. Road conditions are excellent when compared with some other states. Your Information Bureaus might be advertised by roadsigns. They are a great aid.

W. Tobler
Eagle Point, Oregon



. . . We have just completed a 10,000 mile trip from the West Coast to the East Coast and return. We enjoyed our trip through Texas so much that we felt we ought to tell you about it. We entered at Beaumont and left at El Paso. The road was smooth for the most part, well marked, directions were explicit, the "cat eye" markers on curves, etc. were most helpful. Most of all, however, we enjoyed the roadside parks. There always seemed to be one just where we wanted it when we wanted it. We were traveling with two small children and a picnic lunch was great fun for them, and a period of relaxation for us. We found most of the parks very clean, some people are always careless though. You certainly supplied all the facilities for keeping the parks neat and clean.

We did not stop at a Tourist Information Booth until we were leaving the state - for which we were a little sorry. We were interested in the identification of the many wildflowers along the way. The young man was very helpful and generous both with verbal and printed information. He helped make the trip even more enjoyable.

Our thanks to the Highway Department.

Mrs. J. J. Sincavage
Umatilla Ordnance Depot
Ordnance, Oregon



. . . Please note - we drove carefully, but one of your own highway trucks did not and threw up a stone that damaged our windshield. Thought you should warn them too. . .

Mrs. B. Klinger
Cleveland 5, Ohio



IN MEMORIAM

This page of the Construction and Maintenance Bulletin is dedicated to the memory of the late

LEONARD MILLER
SHIRLEY BAILEY
CLARENCE ROSS DAILEY

Leonard Miller was fatally injured when struck by an automobile on June 21, 1951, while working with a maintenance crew on U. S. 90 approximately six miles west of Orange in District 20.

Shirley Bailey and Clarence Ross Dailey were both fatally injured when struck by an automobile on June 7, 1951, while engaged in maintenance work five miles west of Wichita Falls on U. S. 287 in District 3.

To date there have been thirteen fatal accidents to highway workmen since V.J. Day, August 15, 1945. Since that date, there also have been 172 workmen injured either as a result, directly or indirectly, of motorists.

We feel that all of us of the Highway Family should dedicate ourselves to the task, and firmly resolve that we shall endeavor to create safer working conditions for those actively engaged in highway repair work.

